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TRANSACTIONS

OF THE

PHILADELPHIA

ACADEMY OF SURGERY

VOLUME II.

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NOTICE.

The present volume of the *Transactions* contains the papers read before the Academy from January, 1899, to December, 1899, inclusive.

The Business Committee thinks it proper to state that the Academy holds itself in no way responsible for the statements, reasonings, or opinions set forth in the various papers published in its *Transactions*.

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FELLOWS

OF THE

PHILADELPHIA ACADEMY OF SURGERY.

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JOHN H. PACKARD, M.D., Late Surgeon to the Pennsylvania Hospital; Surgeon to St. Joseph's Hospital.

JOHN H. BRINTON, M.D., Professor of the Practice of Surgery and of Clinical Surgery in the Jefferson Medical College; Surgeon to the Jefferson College Hospital; Consulting Surgeon to St. Joseph's Hospital; Late Brigade-Surgeon and Surgeon of Volunteers.

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JOHN H. JOPSON, M.D.

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WILLIAM C. LOTT, M.D.

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TRANSACTIONS OF THE PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, February 6, 1899.

The President, J. EWING MEARS, M.D., in the Chair.

SUPPURATIVE CYSTIC THYROID TUMOR.

DR. THOMAS G. MORTON presented a woman, thirty years of age, who was recently admitted to the Pennsylvania Hospital, with a greatly enlarged thyroid tumor, suffering from dyspnœa, serious pressure symptoms, and great exhaustion. An incision was promptly made on the left side of the tumor, where the distention seemed to be the greatest. At some considerable depth an abscess cavity was reached; a trochar was thrust through the centre of the tumor to the opposite side of the neck, and, through the cannula, a rubber drainage-tube was passed. Rapid subsidence of the symptoms followed, with gradual diminution of the tumor. The drainage-tube had not been disturbed, but would be allowed to remain until the tumor was practically absorbed. In the reporter's opinion, in treating such degeneratory cysts, it was safer to favor their cure by incision and drainage rather than to attempt more radical procedures.

EXCISION OF ASTRAGALUS FOR TALIPES EQUINO-VARUS.

DR. MORTON presented several cases of club-foot, saying that some years ago he had brought before the Fellows of the academy a number of patients from whom he had excised the astragalus for congenital club-foot of the equino-varus variety; the question was then raised, whether or not, in time, ankylosis of the joint would result from this procedure? and the promise was made that, from time to time, the patients would be exhibited

for further examination. This had been done on several occasions, and now he presented still other cases. He stated that, after a large experience, in no instance had such ankylosis occurred, but good ankle motion had been secured.

He recognized in equino-varus two forms, one the *uncomplicated,* the other the *complicated* club-foot; in the former the deformity is due to contraction of tendons and soft parts without displacement of the bones of the tarsus; such cases are corrected by tenotomy, stretching, massage, and apparatus. The other, or the complicated, variety is always associated with displacement, partial or complete, of the astragalus. This bone has been invariably forced forward and out of its normal position; indeed the tibia, in some instances, is found articulating with the os calcis. The astragalus will in such a case be found quite subcutaneous and in advance of the tibia. While it remains in that position it prevents flexion of the foot; it is an obstacle to the foot being brought into a proper normal position. The astragalus, furthermore, becomes so changed in form that it could not perform its normal function in the articulation, even if it could be restored to its usual position. Several years ago he sent two specimens, taken from such cases in his operations, to the late Professor Joseph Leidy, who in reply wrote him as follows:

"The two specimens of bone, submitted to my examination a few days since, are so altered from the normal form that I utterly failed to recognize them as being the astragalus."

It is quite easy to determine the presence of a displaced astragalus, first, from the fact that the foot cannot be made to assume a right-angle position with the leg, and, secondly, it can be readily felt as a subcutaneous, irregular, bony mass anterior to the tibia.

In operating for excision of the astragalus, it is important to first perform very general tenotomy. This consists in dividing the flexor tendon of each toe (a most important part of the operation), the tendo Achillis, and the tendon of the anterior tibial (if found contracted). For the excision of the astragalus, the incision should extend in a straight or slightly curved line from the base of the fourth toe, over the most prominent portion of the astragalus, to the external malleolus. Then the knife is readily carried around the circumference of the bone, and all attachments are divided, and it can be removed with a curved scissors

and a bone-forceps. If there still remain any difficulty in placing the foot in a normal, right-angle position, the cause will be found in the cuboid, or other tarsal bone, and the bone in whole or part, in such case, should be removed. It is seldom that any ligature is required, and drainage will occur through the spaces between the interrupted sutures.

He exhibited two cases of congenital equino-varus (complicated, double), for which he had done an excision of the astragalus and cuboid.

CASE I.—A boy, W. S., aged fourteen, who was admitted to the Orthopædic Hospital in March, 1890. He then did an excision of astragalus and cuboid in each foot, after tenotomy of flexors of toes, and the tendons of the anterior tibial, and tendo Achillis. He has now normal flexion and extension of the foot and perfect position. He wore a brace for a very short time, a few months only.

CASE II.—A. M., aged twelve, who was admitted to the Orthopædic Hospital, November 10, 1898, with complicated congenital equino-varus. The limb was considerably atrophied, foot greatly deformed, and he walked on the cuboid. One week after admission the anterior tibial tendon, the tendo Achillis, and the toe flexors were divided; after which the astragalus, cuboid, and a portion of scaphoid were excised. The foot could then be placed in an easy, normal position. An excellent recovery has followed, with a useful foot and fair ankle motion.

COMPOUND DISLOCATION OF THE ANKLE-JOINT.

DR. MORTON presented a man, forty years of age, who, on November 19, 1898, fell into a cellar, which was some eight feet in depth, and received a serious injury of the ankle-joint. The lower end of the tibia was found protruding through a rent in the skin, where it was tightly held. On the same day, when a free vertical incision was made, the articular tibial surface was found detached, and in fragments was removed; the lower end of the fibula was also comminuted, fragments small, which were removed. The irregular lower end of the tibia was then divided transversely.

The injured (entire) upper surface of the astragalus was likewise removed with chisel, and this bone and the tibia were then united by silver wire.

Immediate union followed without any suppuration. In such a case as this, before the days of present wound treatment, the only operation to be considered would have been amputation.

Contrary to expectation, there has resulted excellent ankle motion, while the contour of the ankle is perfect. An apparatus is still worn to give greater security in walking.

DR. WHARTON remarked that when attempts were made to save these cases before the adoption of present methods of wound treatment, amputation usually followed in a few weeks. Diffused abscess often developed, involving the whole leg, or pyæmia or septicæmia, and death often resulted. The result in Dr. Morton's case is most satisfactory. In a similar case—that of a man who jumped off of an engine, sustaining a fracture of the fibula and a compound dislocation of the lower end of the tibia—he excised the lower end of the tibia, and removed all loose fragments; put up in pasteboards for a few days, and then put on plaster-of-Paris dressings. This man obtained a very useful limb. It is now over a year since the operation was done, and he is walking quite well.

DR. R. HARTE said that he recalled a case almost similar, which he had in St. Mary's Hospital, five or six years ago. When he saw the case it was in pretty poor shape, and he suggested the possibility of resection and taking out the lower end of the leg bones, which he did, and then wired. Although the case was more or less septic at that time, with a large abscess in the leg, he succeeded in getting a very satisfactory result. He saw the man some years afterwards; he was then able to do the ordinary work of a house-carpenter.

FLAT FOOT.

DR. MORTON then presented a case of flat foot, which had been treated by Gifferd's spring, for the purpose of calling attention to that ingenious apparatus, worn inside the shoe, which he thought to be far superior to any other form of apparatus. The patient, a man thirty-two years of age, had suffered for more than two years, but had found entire relief since using this spring-sole in his shoe. The apparatus consists of two pieces of steel held together by a hinge on one side, and between the two is a piece of soft rubber. It is placed in the shoe on the inner side and forms an artificial arch, the rubber holding the plates apart, and the plates yielding with the weight of the body.

FRACTURE OF THE FIFTH CERVICAL VERTEBRA.

DR. T. G. MORTON reported the following case: On December 27, 1898, a man, aged thirty-five years, received an injury to his head as the result of a dive in shallow water, while in Jamaica, West Indies. There was no loss of consciousness at the time, but the patient was much excited, and believed that his neck was broken. There was loss of motion and sensation in the trunk and limbs. His temperature was below normal immediately after the injury (97° F.), but some twelve hours later it had risen to 107°; this, however, was reduced by cold applications to 102°. His condition the following day was somewhat improved, he could move his head and arms and the muscles of his abdomen. The legs were motionless. There was involuntary urination, but he retained control over the bowels. The area of anæsthesia had for its upper border a line extending nearly horizontally around the trunk, just below the nipples. His mind was clear and disposition cheerful. It was believed by his medical attendants that he was suffering principally from heat-stroke and cerebral concussion. He was sent North on a fruit vessel, and was admitted, immediately after his arrival, January 10, 1899, into the Pennsylvania Hospital. Upon admission his temperature was normal, mind clear and cheerful. Sensation was impaired at nipple line, but normal a few inches above. Pupils equal and normally reacting. He could move his head and arms, but there was complete paralysis and anæsthesia of lower half of the trunk and lower limbs. All reflexes in lower limbs lost. Urine drawn by catheter, bowels moved by enema. Temperature 102° on the evening of admission. The urine contained a small amount of albumen, but no sugar. On the 13th, after consultation of the staff, it was decided that there had been an injury of the spine at or near the sixth cervical vertebra, and it was decided to operate. On the following day, under ether anæsthesia, Dr. Morton exposed the cervical vertebræ from the third to the seventh. The laminæ of the fifth were found to have been fractured, and they (with the spinous process) were removed by catching them with the forceps and cutting all attachments. The membranes were not opened, but appeared to be healthy, and when a weak faradic current was applied to the exposed surface, the other pole being on the left foot, decided muscular contractions were observed.

Respirations appeared to be better after the pieces of bone had been removed. The temperature went up in the evening to 104°, but was reduced by cold sponging.

Two days later the patient seemed to be in an improved condition. The pulse was good. He had some twitching of the muscles of the legs during the night. Bowels loose and involuntarily evacuated. The temperature was still elevated (about 104° F.). On the 18th it was noted that there was more movement of the muscles, which react to the electrical current. Sensation still lost and impressions referred to the neck. January 26, the patient spoke of feeling peculiar sensations in his legs. Anæsthesia unchanged, but motion in response to current was improving daily. Patient still had elevated temperature and had lost flesh. The emaciation continued and the strength failed, a large bed-sore formed over the sacrum and spine, which became gangrenous. Death from exhaustion occurred February 4, 1899, his temperature shortly before death was 108°.

At the autopsy the spinal cord was found to be much softened and degenerated at the level of the fifth and sixth cervical vertebræ; the remainder of the cord appeared to be healthy.

At the time of the operation the dura mater, at the bottom of the wound, seemed to be healthy, and it was not disturbed. The wound had contracted, and in large part had healed by first intention shortly after the operation.

Dr. Holmes recounted a similar injury, which had occurred under his observation some years ago, from diving into a shallow public bath. The patient lived two weeks, and died of the injury to the spinal cord. Recently, during his hospital service, a man was brought in who had fallen from the third story of a building and injured his cord, but there was no mark of external injury whatever. By careful examination it was determined that the injury was about the outlet of the fourth cervical nerve, causing paralysis of motion and sensation. Friends would not allow any operation, and the man died in the course of ten days; no autopsy was permitted.

Dr. Burr said that there died, last summer, in Blockley Hospital, a man who had been treated by Dr. Morton some twenty years ago, at which time he had a fracture of the cervical spine,—cause unknown. He was paralyzed entirely in his limbs when sent to the hospital. When he came to Blockley, three

years ago,—this was some seventeen years after the injury,—he was able to walk and to use his arms. He had marked spasm in both legs; some slight trouble in passing water; marked rigidity in the neck, and some wasting about the back of the neck,—muscular wasting. He stayed in Blockley on account of Bright's disease, not on account of his fracture; he used to work in the wards, but finally died. At the post-mortem it was shown that one of the cervical vertebræ was locked over the one above; it had slipped over. The spinal cord was remarkably flattened; it was only about one-half as thick and as wide as it ought to have been. Still it had performed almost all the functions that it could have performed if perfectly normal.

DR. MORTON remarked that in this case the injury occurred in the spring of 1876, during the time of the Centennial Exhibition. While polishing the marble columns in front of the mint, the man fell from a scaffolding and struck his head.

DR. DEAVER said that he had seen a number of fractures of the vertebræ, in some of which he had done the operation of laminectomy. While it has not been attended by success, yet he felt it to be a perfectly warrantable procedure, as he had never known a patient to die from shock in his own personal experience. In the case of a man in the German Hospital, who met with a fracture of the upper thoracic vertebra, as demonstrated not only by palpation but by an X-ray picture, and was paralyzed, laminectomy was suggested, but was not accepted by Dr. Deaver. For several weeks he was completely paralyzed. But now he sits up; has perfect control of his arms; some little control of his legs, and control of his bladder. With that sort of experience—having had experiences not so favorable as that from operation—it makes one hesitate about doing an operation. He believed laminectomy to be a proper procedure; but that it promises most as an early operation,—that is, done immediately and not ultimately. Most of these injuries occur from extreme flexion of the spinal column. Such cases are not likely to give good results. In cases of direct traumatism, as the one Dr. Morton reported, operation would be more promising.

DR. HARTE agreed with Dr. Deaver that the time to operate on spinal injuries is in the beginning instead of waiting until some time had elapsed. He had done the operation of exposing the cord, for the relief of supposed pressure in the upper region of

the neck, twice in the last few years, but with unfavorable termination. Such cases all die in a very short time. But if surgeons could succeed in saving or restoring the function in one out of fifty cases, it would make the operation justifiable. Personally he was inclined to pursue a conservative course. Fractures of the cervical vertebræ are known to be extremely dangerous,—that is to say, the patients die very frequently within forty-eight hours or three days; very seldom they recover. The advisability of laminectomy increases as one descends the spine.

Dr. Wharton said that he had seen some operations of laminectomy for fracture in the cervical and also in the dorsal region, some undertaken early and some in which the operation was delayed several weeks, but in none of these cases had he observed decided improvement follow. In most of these cases it was found that the cord practically had been torn at the time of injury; the injury being produced by falls on the head or buttocks, causing violent flexion of the spine and rupture of the cord. He had seen a few cases in which conservative treatment was followed by good results. In one case a man was caught under a trolley-car and had a fracture in the second lumbar vertebra; this case recovered with apparently perfect motion; he had really very little paralysis at the time of admission. He has at the present time a little anæsthesia at the anterior portion of each thigh, rigidity, and distinct deformity in the seat of fracture, but, with these exceptions, he is in good condition.

Dr. T. R. Neilson had had experience with two or three cases of laminectomy. One was in a case of high lumbar fracture, another was middorsal, and the third was also dorsal. So far as the operation is concerned, his experience in these three cases quite agreed with that of the other speakers. He saw no immediate ill effects of the operation, and he did not think that under ordinary circumstances, certainly below the cervical region, the element of shock need be considered, on account of the great difficulty of diagnosis, in some cases, of spinal injury. If there is plausible reason to believe that there is fracture with displacement, then he saw no objection, and in some cases thought there was very distinct indication for laminectomy to be performed, but the great trouble is to determine what the lesion is that is to be dealt with. In the three cases that he had seen, the destruction of the cord was so great, so complete, that the operation

might just as well have been left undone, so far as the ultimate results were concerned. On the other hand, he had seen, like others, fracture of the spine, in which very fair ultimate results were obtained without operation, the patient living for a number of years, gradually recovering after many weeks or months following the injury, with more or less control of certain groups of muscles, perhaps all in a given limb or area. He recalled a case, in his wards at the Episcopal Hospital, of a young man about twenty, who had sustained an injury in the cervical region while wrestling. He was violently thrown in some way. There was paralysis from the clavicle downward, but he could detect no displacement. So he simply left the patient to take his course, watching him carefully, and using such medicinal treatment as was indicated to meet individual symptoms. The man recovered completely within a reasonable length of time, getting perfectly and absolutely well. He knew of cases, on the other hand, where an operation was done for just exactly such symptoms, and where the cord was found injured beyond all hope of repair. It is often impossible to know how extensive the injury is without exposing the site, and, therefore, the question is not merely how to operate or to determine the element of danger, but how to reach an accurate diagnosis.

DR. J. EWING MEARS detailed the case of a woman, who was admitted to the surgical wards of St. Mary's Hospital, suffering from an injury of the vertebral column, caused by a fall from the second story of her house. In this fall her back came in contact with a corner of the stone step in front of the house, which resulted in producing a fracture of the last dorsal and the first lumbar vertebræ. On examination, it was found that the patient was suffering from paraplegia as a result of the injury. Some days after her admission he performed laminectomy. Subsequent to the operation the patient showed marked symptoms of improvement, then he lost sight of the case.

He believed it was not only justifiable, but incumbent upon surgeons to interfere in these cases. Relief afforded to one patient is encouraging, and should induce surgeons to operate in all cases where possibly relief may be afforded. It is impossible to determine, of course, the exact extent of the lesions which may exist without such an inspection as an operation will afford. As has been stated, the operation *per se* is quite

devoid of danger, and therefore the patient is not subjected to very grave additional conditions. By repeated operations our knowledge will be increased, both with regard to diagnosis and the results of treatment.

DIFFERENTIATION OF VERTEBRAL SYPHILIS FROM POTT'S DISEASE OF THE SPINE.

DR. CHARLES W. BURR reported the following case: A single man, thirty-one years old, was admitted to the Philadelphia Hospital, August 3, 1896, complaining of loss of power in the arms and legs. He at first denied and later admitted having had syphilis. Five years before his admission to the hospital he fell from a low scaffold, striking the back and occiput. He was confined to bed five weeks on account of injuries to the chest, but had no paralytic or other spinal symptoms. One year later he was caught between two cars, bruising the chest and back, but was absent from his work only a few days. He continued in good health until the onset of his present trouble, in October, 1895. At that time his neck began to be stiff and his head became forcibly retracted. By December he was unable to move the rigidly retracted head at all. In May, 1896, he gradually began to lose power in the left arm, left leg, right arm, and right leg in the order named. He never had severe pain in the spine or extremities. For several months he has had difficulty in micturition, and frequently uses a catheter.

Examination showed complete loss of power in both upper arms, with some slight retention of movement in the forearms. He can flex and extend the legs while in bed, but can scarcely stand alone, and even when supported can walk only a few steps. The legs are stiff from extensor spasm and voluntary or passive movement makes them more so. The hands are contractured, the first phalanges being hyperextended, the others flexed. He can flex and extend the head a little, but cannot rotate it, apparently not because of palsy or spasm, but on account of a mechanical resistance to the movement. It is no longer retracted, but sits upright upon the neck. The back of the neck is full and rounded, and a firm, ill-defined, not very painful mass is present over and on either side of the cervical vertebræ. The skin is movable over it, but it seems to be attached to the bones beneath. Though there is ordinarily little pain in it, pressure upon it causes

great suffering. The pharynx is normal. There is no evidence of bone-disease in its posterior wall. The cervical glands are enlarged. The knee-jerks are very much increased, ankle clonus is present, and the biceps-tendon jerk is active on both sides. The muscle-jerks are present in the arms and legs, but much more marked in the latter. Tactile sensibility is preserved over the entire body. There are some spots of hyperæsthesia upon the legs, the position of which shifts from day to day. There is considerable disturbance of the temperature sense, his replies when touched with a warm or cold object being incorrect almost as often as they are correct. He apparently has no true appreciation of temperature. He complains—and this has been for several months, but after the onset of the palsy—of pricking and tingling sensations in the arms and in the legs below the knees. There is marked wasting of the muscles of the hands and forearms, none of the upper arms or legs. There are no cranial nerve palsies. The pupils are equal, moderate in size, and react well to light and with accommodation. He has great difficulty in passing water and is obstinately constipated. The thoracic and abdominal organs are normal. There is some cystitis; a little pus, a trace of albumen, but no casts in the urine. Upon the legs are syphilitic scars. He had no fever while in the hospital.

He was kept upon his back and given iodide of potassium and mercury, both of which he bore well. After several months he had improved so much that he was permitted to go out on parole. He did not return. The deformity of the spine had disappeared. He could walk well and use his hands fairly well. The deep reflexes were still increased, and there was still some wasting in the hands and forearms. He could micturate without trouble.

Part of the diagnosis was easy enough. He evidently had a cervical meningomyelitis. The combination of irritative and destructive symptoms proved this. The onset with retrocœlic spasm, followed by a wasting palsy of the arms, and a spastic palsy of the legs were enough to localize the lesion in the cervical region of the cord. The more important part of the diagnosis—namely, the primary cause of the nervous symptoms—was more difficult. The diagnosis of syphilis was made, not upon the nervous symptoms; it was only in small degree a conclusion

drawn from the results of physical examination, it was largely a happy guess based upon the history of a previous syphilitic infection. The mass in the cervical region was assumed rather than proved to be a gumma. The assumption turned out to be well founded and right. It might have been wrong. Only the course of events proved that it was not a malignant growth or inflammatory from tuberculosis.

Dr. Burr further remarked that to determine whether any given case of compression myelitis is tubercular or syphilitic is easy or difficult according to circumstances. In those cases in which a well-defined gummatous growth is visible and palpable, there need be no difficulty. In other cases, in which a syphilitic exostosis grows into the spinal canal and encroaches upon the cord, diagnosis may be impossible. In the very rare cases of syphilitic caries of the bodies of the vertebræ the bony deformity and the nervous symptoms may exactly simulate tubercular caries. There is no reason why they should not, for the nervous symptoms of Pott's disease are due largely to the meningitis which, in its turn, causes a myelitis, and it matters very little whether the irritation causing the meningitis is syphilitic or tubercular. Again, the bony deformity is a mechanical thing depending not at all upon the pathologic nature of the caries.

We are driven, then, to other grounds entirely upon which to base a diagnosis. Zasinski, who has collected quite a large number of cases of all types of syphilitic vertebral disease, concludes that primary bone tuberculosis does not occur in the adult, hence, if in an adult he finds angular deformity or other sign of Pott's disease without evidence of visceral tuberculosis, he assumes syphilis or a tumor. If he finds evidence of syphilis in other parts of the body, he excludes new growth. In any event, he employs the therapeutic test. Leyden lays stress upon the fact that syphilitic vertebral disease may have more than one primary focus, whereas tuberculosis is never multiple in the spine. The mode of onset and course of the nervous symptoms may be of some diagnostic value. Tubercular caries almost always begins in the bodies or intervertebral disks, whereas syphilis may begin anywhere, in the periosteum or in any part of the bones. It follows that the early nervous symptoms of tubercular disease are always or almost always dependent upon disease of the anterior part of the cord, are motor, and that though they may first

appear in one extremity they soon become symmetrical, whereas in syphilis any part of the periphery of the cord may be first affected, and if the lesion be a gumma or periostitis instead of caries of the bodies, the symptoms may be asymmetrical and aberrant for some time. Thus, in the case reported, palsy first appeared in one arm, then in the leg of the same side, then in the other arm, and last in the other leg. This would be a very unusual course in tubercular disease.

(1) Two days after the date of the foregoing remarks a patient, who had had a spastic paraplegia for many months, died, and a necropsy was made. He was about sixty years old. He had had a slowly on-coming spastic palsy of both legs with increase of the knee-jerks, ankle clonus and retention of urine, without anæsthesia. There was no deformity of the spine and no localized pain. Post-mortem the spinal dura was found thickened by inflammatory tissue on its outer surface, in the region of the tenth dorsal vertebra. It was somewhat adherent to the body of the vertebra. There was no inflammation of its inner surface, and the pia was not thicker than normal and was transparent. The vertebral body was somewhat carious, but not enough so to disturb its form. Macroscopically the cord seemed normal. There has not yet been time to make a microscopic examination of it. There were no evidences of tubercular or syphilitic disease in the thoracic or abdominal viscera. Death resulted from chronic nephritis. It seemed to Dr. Burr that the caries was tubercular, was primary in the spine, and hence is strong evidence against the opinion quoted above.

Dr. G. G. Davis said that he was positive that he had seen primary tubercular disease of the bones of the spine in adults, and he would be unwilling to accept that as a diagnostic point,—that is to say, the occurrence of kyphosis in an adult without tubercular disease elsewhere as being proof of syphilitic disease of the spine. He certainly thought that in adults, in just the same way as in children, but not so frequently, tubercular disease of the bones of the spine develops, following, for instance, slight injuries, and they show a marked kyphosis.

Dr. William J. Taylor stated that he had had rather a large experience in these cases of spinal disease, and that he could only recall one instance where syphilitis could be considered as a probable cause. This was in a child of three, with a distinct

history of inherited syphilis, and an acute Pott's disease as well, but it was also impossible to eliminate entirely the question of tuberculosis. He had seen several instances of primary tuberculosis of the spine in adults where the possibility of a syphilitic taint could be thoroughly excluded.

BACKWARD LUXATION OF THE ASTRAGALUS AT THE ANKLE-JOINT.

DR. W. B. HOPKINS presented a man, aged thirty-five years, who was brought to the Pennsylvania Hospital, December 22, 1898, for an injury received by being caught in shafting while attempting to slip a belting on a wheel. Besides a severe laceration of the scrotum, which laid bare the tunica vaginalis and the sac of an inguinal hernia, he had sustained a dislocation at the ankle.

The foot was inverted to nearly a right angle. The anterior border of the articular surface of the tibia could be plainly seen beneath the skin, while the trochlea of the astragalus could be felt behind the ankle-joint. A plaster cast was at once taken of the injured parts. (Fig. 1.) Reduction was accomplished unintentionally by simply lifting the foot from the table by the toes, while in the act of cleansing it. The luxation could, however, be reproduced without effort at will by gently forcing the foot backward. In studying the deformity consequent upon this dislocation, it is interesting to note that the marked inversion of the foot is caused by the tibia resting upon the slanting plane of the tarsus, corresponding to the upper surfaces of the neck of the scaphoid. As can be readily demonstrated upon the skeleton, this is the point on which the tibia would naturally rest in occupying its new position.

The limb was placed in a fixed dressing, which was removed in five weeks. The patient never had any pain or discomfort from the luxation, his convalescence being entirely uneventful, but his scrotum suppurated, and now, at seven weeks, is not entirely healed, though he walks on his injured foot with ease.

DR. DE FOREST WILLARD remarked that he had seen no cases of simple dislocation of the astragalus from the calcaneum, but he had seen a number of compound luxations with and without fracture, where it was necessary to excise a whole or a

FIG. 1.—Showing deformity after dislocation of the astragalus at the ankle-joint.

FIG. 2.—Showing deformity after dislocation of the os calcis and scaphoid from the astragalus.

portion of the astragalus. Where the astragalus has been removed the results of motion at the ankle-joint are better than where it has been allowed to remain. The articulating face of the calcaneus coming up against the articulating face of the tibia makes a very good ankle-joint afterwards, consequently, in a case of compound dislocation, accompanied by fracture, removal is a desirable procedure.

DISLOCATION OF THE OS CALCIS AND SCAPHOID FROM THE ASTRAGALUS.

DR. W. B. HOPKINS presented a plaster cast of a foot and ankle in which a dislocation of the os calcis and scaphoid from the astragalus had occurred. He said that in describing dislocations it is on some accounts unfortunate that no fixed rule has ever been consistently adhered to, in naming the proximal or distal bone contributing to the displacement, as the bone dislocated. While the dislocation of any joint is more commonly named by the distal bone, such a definition is at times awkward and misleading. Thus to call an upward luxation of the acromial end of the clavicle a downward luxation of the scapula might readily be misunderstood, while in the dislocations about to be reported, the joint dislocated must be carefully specified in order to avoid confusion. An injury was described as above by Mr. George Pollock in a paper read before the Royal Medical and Chirurgical Society of London, entitled "Dislocation of the Os Calcis and Scaphoid from the Astragalus." While in this manner the injury is distinctly located, such a heading would easily escape observation in looking up references for a collection of data. As this latter consideration is very important in the titles of all subjects, to follow usage, without aiming at entire consistency, is perhaps the best alternative.

The case from which the plaster cast was taken (the man having been a patient of the Pennsylvania Hospital while the reporter was resident surgeon) has a history as follows:

J. D., aged thirty-six, a powerfully built, healthy man, while lowering a barrel of shellac from his wagon lost control of it, and rolling down the plank it struck both of his legs in front with great force. He had a compound fracture of his left leg. There was found great deformity of the right foot, consisting in a marked prominence about an inch and a half in front of the ex-

ternal malleolus, over which the skin was tightly drawn and which was easily distinguished as the smooth head of the astragalus. The foot was markedly inverted, but the contour of its plantar aspect was normal. The patient was etherized and the plaster-of-Paris cast (Fig. 2) was expeditiously taken. A more careful examination verified the diagnosis, showing the astragalus normally articulated at the ankle, but dislocated outward from the os calcis and scaphoid. There was no fracture. The dislocation was easily reduced by forcible eversion of the foot and counterpressure with the thumbs upon the head of the astragalus. Both limbs were placed in a fracture-box, a fixed dressing being applied later on to the right foot.

A second case was admitted to the Episcopal Hospital in 1894. A man, aged forty-eight, had fallen from the rigging of a vessel to the deck, a distance of thirty feet, and had landed on his feet. The same deformity of the left foot as in that of the other case was observed, except that the head of the astragalus was not quite so prominent, nor was the inversion of the foot so complete. The articulation of the astragalus at the ankle-joint was undisturbed, and there was no fracture. The patient was etherized, and the dislocation reduced as in the other case, and with as little difficulty. A plaster-of-Paris dressing was applied. The patient made a good recovery.

Although in the paper by Mr. George Pollock, above referred to, thirty-two simple dislocations of this articulation of the astragalus have been collected, the injury is certainly a very rare one. Its occurrence depends upon the action of forces similar to, if not identical with, those causing the various fractures about the ankle-joint, which are among the most common of fractures of the lower extremity. The reduction, as stated in the two cases reported, was very easy, which would appear to be the exception and altogether contrary to the experience in most cases. An analysis of Mr. Pollock's table—that part of it relating to simple luxations—sufficiently demonstrates the extreme gravity of the injury. Six died, one recovered after amputation, three recovered after resection of the astragalus, eight recovered after unsuccessful efforts to reduce it, in one case the result was uncertain, and thirteen recovered after reduction. In his whole list, which includes compound as well as simple dislocations, of which fifty-five are tabulated, the results are not encouraging. The total number of reductions being only eighteen.

Bony pelvis prepared to illustrate case of sacro-iliac dislocation.

COMPLETE SINGLE SACRO-ILIAC DISLOCATION.

By WILLIAM BARTON HOPKINS, M.D.

H. F., aged eighteen years, was admitted to the Pennsylvania Hospital December 23, 1898, having been caught in an elevator. The patient on admission showed considerable shock. The expression of the lower extremities suggested the existence of luxation of the femur upon the dorsum of the ilium, as the left limb was shortened and the foot everted, as in "everted dorsal dislocations." Examination of the hip-joint, however, showed it to be unhurt. Turning the patient upon his right side, the left ilium was found to entirely overlap the sacrum, so much so, that the tips of the fingers could be insinuated beneath it, as they can beneath a scapula. Exploration was then made for the other point, which had yielded to allow of this break in the pelvic ring. As was expected, it was found at the symphysis pubis. The joint was quite mobile, the mobility being easily discernible by pressure upon the anterior processes of the ilium. The left limb was shortened because the ilium had risen above its normal position, and the limb was everted because the ilium in riding over the dorsum of the sacrum had altered correspondingly the direction of the acetabulum. (The deformity as it existed is graphically demonstrated in the accompanying illustration.) A deep right-angled contusion of the integument over the left side of the sacrum testified to the violence of the forward pressure which had caused the dislocation. There was no paralysis, nor was there evidence of concealed hæmorrhage of any severity. The patient was etherized after recovering somewhat from the shock, with the view of attempting to reduce the dislocation. The indications to accomplish this result were recognized to be forward extension of the ilium and counter-extension backward of the sacrum. Traction upon the glenoid cavity conveyed through the left thigh, flexed at a right angle with the long axis of the body, was decided upon as the most effective forward extension of the

ilium. For the backward counter-extension of the sacrum the natural procedure of placing the operator's foot upon the abdomen, at a point corresponding to the promontory of the sacrum for counter-extension, was not available here, lest further mischief should be done to the already damaged pelvic contents. Backward counter-extension of the sacrum was therefore obtained through the spine and right glenoid cavity. Through the spine by looping a sheet around the abdomen and tying it to the edge of the bedstead, and through the glenoid cavity by forcible counter-extension at the hands of two assistants. Two strong efforts accomplished the restoration, not absolutely, but so nearly that the edges of the sacrum and ilium were felt to abut against each other, and the deformity to be almost entirely overcome. It was decided that if the patient recovered, as no inconvenience whatever could result from the slight deficiency remaining in adjustment, it was more prudent to desist from a further effort. Patient was placed on his back, upon a hard mattress, with sand-bags at his hips and a compress beneath the left ilium. There was considerable abdominal tenderness, and tympany for one week, which then subsided. After this the patient showed no unfavorable symptoms. He was allowed to sit up in six weeks, and at the end of seven weeks walked with crutches. There was no tendency to recurrence of the dislocation, and the patient made a good recovery.

Harris (*North American Medical and Surgical Journal,* Philadelphia, 1827, Vol. iv, p. 77) mentions the case of a woman, thirty-five years of age, who had borne one child, where the injury was inflicted by a blow upon the sacrum from the clinched fist of her husband. A frail, delicate woman whose pelvic joints had presumably been weakened by pregnancy.

Dr. Gibson, who was called in consultation, found, upon examination, a considerable hollow over the upper part of the sacrum, produced by the unnatural backward projection of the posterior superior spinous process of the ilium. When the patient moved her right leg, an aggravation of the pain was experienced, accompanied by a distinct crepitation. The slightest motion conveyed an impression to her as if, to use her own language, her "hip-bones were separating."

Mr. Thorsby Jones (*British Medical Journal,* 1878, Vol. i, p. 5) reported a case of fatal injury from being struck by a locomotive engine, in which there was partial forward luxation of the sacrum from both ilia. In this case the patient died in seven hours. His notes of the autopsy being as follows:

"An extravasation of blood was found occupying the recto-vesical pouch and the loose tissue around; and on dissecting through this, the ilio-lumbar artery, on the right side, was seen to be wounded. The veins on this side were unhurt; but on the left side the external iliac vein was wounded at a point opposite the left sacro-iliac articulation. On removing the rectum, bladder, the vessels, and loose tissue from the pelvis, it was at once seen that the sacrum was unusually prominent; and further examination showed that it was separated from its articulation with the ilium on each side. The anterior sacro-iliac ligament was ruptured,—all but a few of its fibres. The anterior border of the articulating surface of the sacrum was at least a quarter of an inch in front of that of the ilium on both sides. The posterior aspect of the articulation was then examined, and here the ligaments could not be well defined, on account of the laceration of the glutæus maximus and the extravasated blood. A careful examination was then made of the whole of the pelvis, and at no point was a fracture discovered."

Dr. E. A. Lewis, of Brooklyn (*New York Medical Journal,* 1885, Vol. xlii, p. 715), reports a case of a man who, while riding on horseback, was unseated and came down astride of the withers of the horse. Though there were very painful symptoms pointing to injury of the sacro-iliac articulation, there was no external evidence of displacement. He reports a second case, also without deformity, which presented symptoms, nevertheless, of serious disturbance at this joint.

A case of so-called sprain of the sacro-iliac joint, caused by lifting, which was followed by abscess and death, in a tubercular subject, is mentioned in the report of the Marine Hospital service.

The case which I now report will be seen to differ essentially from any of those above mentioned. The important factor of deformity, the primarily essential feature of displacement at the sacro-iliac joint, has been so frequently wanting in cases which were presumed to be dislocations, that one recognizes a certain incredulity among authors, when speaking of supposed or unauthenticated cases of this injury; it is spoken of as a dislocation difficult to recognize. Not so in this case, as stated in the report, the fingers could be insinuated beneath the ilium as they can beneath the scapula of a thin and relaxed subject. The shortening of the limb on the injured side, which I believe was an inch, and its rotation outward, as in everted luxation of the femur upon the dorsum of the ilium, sufficiently proved the degree of overlapping of the sacrum by the ilium. The intense pain immediately after the receipt of such an injury, which has characterized other cases, was not observed in this case; probably owing to the patient's condition of shock. The intense pain observed for weeks after, on the slightest motion or change of position in bed, was perhaps avoided in this case by retaining the patient in a state of fixation; that there was no hæmorrhage nor paralysis fortunately prevented serious, if not fatal, complications. While not attempting, therefore, to have exhausted the literature of this very rare and interesting injury, I venture the opinion that it is the first case recorded of complete sacro-iliac dislocation occurring in a sound pelvis to recover after reduction.

TRANSACTIONS OF THE PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, March 6, 1899.

The President, J. EWING MEARS, M.D., in the Chair.

PANCREATIC CYST.

DR. THOMAS S. K. MORTON reported the following case: A woman, thirty years of age, had noted thirteen months before coming under his observation a swelling in her epigastrium, as a lump behind her stomach, which had arisen after an experience of colicky pains in the epigastrium, with occasional violent exacerbations, making in all a period of two years from the first observation of the pains up to the time of her coming to Philadelphia. Eight months before operation the mass in her epigastrium had become as large as a cocoanut, and she consulted a surgeon in Cleveland, who, finding that it fluctuated, aspirated the fluid, and proved, on analysis, that it changed starch into glucose and emulsified fat. She returned to her home subsequently, and remained comparatively comfortable for a short time, the swelling, of course, having temporarily disappeared. Something over a pint of fluid was withdrawn. It was colorless and watery and had the chemical properties before mentioned. Recurrence of swelling, however, promptly came about, with an amplification of her former colicky pains. Occasionally she had an exacerbation, which amounted to agony. This history made diagnosis easy. The tumor presented immediately beneath the ensiform cartilage and apparently displaced the stomach and colon downward. A small median incision, not more than an inch and a half, was made in the epigastrium. The tumor, which then was the size of a canteloupe, was opened and the edges of the sac were united with the skin of the abdominal wall. About three pints of fluid were withdrawn, having the same properties

as the fluid first drawn from the cyst.—namely, that it was of neutral reaction, colorless, watery, not thick, emulsified fat to a slight degree, and to a greater extent converted starch into sugar. There was a moderate discharge of fluid from the sac for several days subsequently. The method of draining was a large rubber tube, which was in turn surrounded by a spirally wrapped rope of iodoform gauze. No hardening or other trouble with the pancreas could be detected. On the fourth day the gauze wicking was withdrawn, and at the end of ten days the tube was left out. She returned to her home three weeks after the operation. The sinus continued to discharge for two months more, when it closed spontaneously. She has been perfectly well ever since, now a period of nineteen months.

MOVABLE KIDNEY.

DR. JOHN B. DEAVER read a paper with the above title.

MOVABLE KIDNEY.

By JOHN B. DEAVER, M.D.,

SURGEON-IN-CHIEF TO THE GERMAN HOSPITAL.

In the present paper movable kidney will be discussed entirely from a practical stand-point. It is a well-known fact that movable kidney is more common in women than in men; that the right kidney is the organ more commonly at fault, and that both kidneys may be movable. It is asserted that most women who are affected with this condition have borne children, or had an abdominal tumor removed; but this is not in accord with my personal experience. In fact, the greater number of cases coming under the writer's observation have been in unmarried women of a markedly nervous temperament. The question of the cause or causes of movable kidney is debatable, and one which is not by any means definitely settled. The determination of the cause is not a practical point; but the practical considerations are the detection and correction of the abnormality, the method of treatment for alleviation of the symptoms, and the operation which is safest and least likely to be followed by a return of the deformity. I will therefore speak of the symptoms of movable kidney,—the differential diagnosis between this condition and those affections which may be mistaken for it, and the operative treatment which has given the best results in the writer's experience.

Movable kidney may be indicated by the presence of an abnormal depression in the flank; but this I regard as of little moment in the diagnosis of a movable kidney, a movable tumor characteristic in shape, which, by properly directed pressure, can be restored to its normal position. The best position of the patient in which to detect and re-

place a movable kidney is lying upon the side opposite to that of the organ supposed to be affected. The legs should be flexed upon the thighs, the thighs strongly flexed upon the abdomen, and the spinal column flexed so as to bend the trunk as far forward as possible. The patient is now requested to take one or two deep inspirations, so that, if the kidney is movable, displacement of the organ will be assured. In this position the kidney is readily detected and returned to its normal position.

Auscultation over or in the immediate neighborhood of the displaced organ may elicit a bruit, the result of twists of the renal vessels. The bruit as well as perceptible pulsation of the abdominal aorta, due to traction on it by the renal artery of the affected kidney, disappears when the kidney is pushed back into its natural position. Throbbing of the aorta is frequently felt and seen in these cases, and should not be mistaken for aneurism. Slight catarrhal jaundice is present in a small percentage of cases, the result, I believe, of the general catarrhal condition of the lower alimentary tract, from which so many of these patients suffer, and not to parietal obstruction of the common or the hepatic duct by traction of the displaced organ.

In discussing the symptoms it must not be forgotten that, in a large percentage of cases, the condition gives rise to no trouble. The more common symptoms are a sense of dragging and discomfort, pain in the lumbar region of the affected side or pain referred to other regions, as the chest-wall in the line of the intercostal spaces. In the majority of cases the symptoms are those of neurasthenia with dyspeptic derangement, flatulence; and more particularly attacks of mucous diarrhœa. In movable kidney, but more especially when the organ has a more or less wide range of motion, the patient may be suddenly attacked with excruciating abdominal pain, paroxysmal in character, attended by nausea, vomiting, chills, a subnormal temperature, or it may be that the temperature is elevated to the degree of fever. Associated with these acute symptoms are marked rigidity and tender-

ness of the part of the abdominal wall overlying the displaced organ and for some distance beyond; and pressure upon the organ causes a sickening pain,—"fainting pain." Coincident with the above condition is frequent desire to urinate and pain referred in the line of the ureter. I have in occasional instances seen hæmaturia. In some cases the patient describes the sensation of a moving body within the abdomen, and others claim to be able to feel and locate it. The variability of the pain, referred here, there, and yonder, is understood when we recall the rich net-work of sympathetic ganglia and nerves in relation with the kidneys and suprarenal capsules. The pain in movable kidney is aggravated by assuming the erect posture. The pain may resemble that in nephritic colic. Paroxysmal attacks of pain are most likely to be excited by unusual exertion of any kind, such as dancing, etc. In females they not uncommonly occur during menstruation. The attacks of pain are frequently preceded by diminution in the quantity of urine passed.

The conditions between which and movable kidney we have especially to distinguish are a displaced spleen, an enlargement of the gall-bladder, a growth of the pylorus, of the head of the pancreas, or, of the ascending or descending colon, mesenteric or omental growths, an elongated lobule, circumscribed abscess or echinococcus cyst of the liver, an ovarian tumor with a long pedicle, a pedunculated uterine fibroid, appendicitis, and nephritic colic. The differential diagnosis between a movable kidney and the above conditions is, in the absence of acute symptoms, usually not difficult. Movable kidney attended by acute exacerbations of pain, vomiting, and circumscribed rigidity of the overlying belly wall, may be very difficult to distinguish from acute appendicitis, or an elongated lobule of the liver, the site of a circumscribed abscess.

The points of difference between a displaced spleen and a movable kidney are that in the former the shape of the organ, the recognition of the hilum, the greater range of motion, the difference in the location of the organ, the absence

of splenic dulness over the normal site of the spleen, the absence of urinary symptoms, which are present to a more or less degree in a greater number of cases of movable kidney, and the ability to return the organ to its natural position, where it can be located by percussion.

Between an enlarged gall-bladder and a movable kidney the points of difference are—the position which the gall-bladder occupies, the fact that in enlarged gall-bladder the lower part of the tumor is more freely movable than the upper; that the lower end of the gall-bladder enlargement is more rounded and less resistant on pressure, the absence of jaundice, and of a cholelithiatic history. In some cases of gall-bladder enlargement a sense of fluctuation is elicited. However that the lower end of the tumor formed by enlargement of the gall-bladder can at times be carried into the loin-space, to the extent of making the latter prominent, and thus simulate a replaced movable kidney, I have demonstrated upon more than one occasion. When the patient is in the supine position and the lower end of an enlarged gall-bladder is sufficiently movable to permit of its displacement into the loin-space, that organ returns to its normal position after removal of the pressure, while this is not the case with a reposited movable kidney, if the patient observe strict quiet and does not breathe deeply. The conditions under which this is impossible are when the gall-bladder is tied and matted to the adjoining viscera by exudate or strong adhesions.

Between a growth of the pylorus and a movable kidney there is some resemblance, in that the growth of the pylorus may be very movable and that in size it may resemble a kidney. Differentiation of the two, however, should not be difficult. The pyloric growth differs in shape, is ordinarily of stony hardness, and has an irregular surface, and in the majority of instances is felt in the immediate neighborhood of the umbilicus, and is flat upon percussion. Further, the age of the patient, about middle life, loss of flesh, cachexia, in some instances gastric symptoms, which may arouse sus-

picion, and which, upon careful examination of stomach contents, etc., may shed light upon the diagnosis.

Between a growth of the head of the pancreas and movable kidney there should be little difficulty in arriving at a correct conclusion. A growth involving the head of the pancreas, which in the majority of instances is malignant and, like retroperitoneal growths, is immovable, irregular in outline, and presents to the educated examining finger a sense which is not communicated by a movable kidney. Further, the time of life at which these growths are most likely to occur, the condition of the patient, and their frequently associated symptoms of gastric or hepatic disturbances, so often accompanying malignant disease of this gland, should not be overlooked. Again, if the growth trespass upon the common bile-duct, where it occupies the pancreatico-duodenal sulcus, jaundice will be a symptom.

Between movable kidney and a growth of the ascending, transverse, or descending colon, a growth of the mesentery or of the omentum, or a fæcal mass in the colon, there should, ordinarily, not be much difficulty in arriving at a correct conclusion. These growths are dull upon percussion, and seldom can they be displaced into the lumbar region. They are more commonly located near the middle line of the abdomen, are malignant in nature, do not present the sensation to the finger which is so characteristic of a movable kidney when it slips away from the palpating hand, are irregular in outline, and communicate to the examining finger a peculiar hardness characteristic of a carcinoma. Further, evidence of dyscrasia and of bowel-disturbance, such as diarrhœa with tenesmus, or constipation, the presence of mucus or blood in the stools, loss of flesh and perhaps a cachexia, family history, etc. The time of life at which these growths are most commonly seen may influence the diagnosis. A sarcoma of the wall of the large bowel is more likely to cause an error in diagnosis, particularly, if it is present, as a pedunculated growth. If a fæcal mass is suspected, the administration of purgatives, high injections, etc., will clear up any doubt.

Between a movable kidney and an elongated lobule of the liver, a circumscribed abscess occupying an elongated lobule of the liver, or an echinococcus cyst of the liver, the diagnosis should be made by observing that, in the presence of an elongated lobule of the liver the dulness upon percussion is continuous with that of the liver; that the lower end of the tumor is more rounded; that it is smooth in outline, and that in forcing it into the loin-space much more pressure is required than in restoring a movable kidney.

Between movable kidney and a circumscribed abscess occupying the site of an elongated lobule of the liver there should be but little, if any, difficulty in differentiating, when it is borne in mind that a movable kidney, except during an exacerbation of acute pain attended by vomiting, rigidity of the overlying abdominal wall, etc., presents no symptoms of an inflammatory affection. The absence of deep fluctuation, of the characteristic hectic temperature of liver abscess, of increased pulse-rate, of chills, of pain referred to right shoulder, and of constant tenderness over the affected area, whereas immobility of the growth and leucocytosis, detected by examination of the blood, indicate abscess.

A movable kidney may be distinguished from an echinococcus cyst of the liver occupying the epigastric or right hypochondriac region by observing the following points: An echinococcus cyst of the liver is an immovable, painless enlargement, either regular or irregular in outline, and presents a smooth surface, fluctuation, and possibly the hydatid tremor. It has existed for some time, grew downward from the liver, and has caused no disturbance of the health.

Between a movable kidney and a small cystic or a solid ovarian tumor and a pedunculated uterine fibroid the diagnosis is ordinarily not difficult. The points to be considered in the differentiation are the size and form of the movable tumor, the direction in which it is most readily displaced, if a kidney into the loin-space, if ovarian or uterine in the direction of its attachment to the latter, the tendency to increase in size, the absence of urinary symptoms which attend many

cases of movable kidney, and the presence of fluctuation, if it be a cystoma of the ovary. The diagnosis may, however, be attended with difficulty.

The symptoms occasioned by the ovarian or uterine condition are usually not present until the growth is of considerable size, which would mark it from movable kidney.

Movable kidney is differentiated from appendicitis by observing the following points: in arriving at a correct diagnosis between movable kidney and appendicitis, first in importance is the fact that movable kidney is most commonly seen in neurasthenic women who have gastro-intestinal disturbance. The attacks of pain in movable kidney are associated with nausea and vomiting, fever, and often chills. In the majority of instances the urinary function is disturbed, as instanced by the frequent desire to urinate, the act of which may be painful and the urine large in amount, particularly if the patient is of a nervous disposition. The urine may contain blood, and, as I have seen in some attacks, pus, but the high color of the urine is more likely to be due to the presence of an excess of uric acid or oxalates. The differentiation between the local disturbance during an attack of pain in a movable kidney which is dragging upon its pedicle, and appendicitis is, to say the least, highly important. From the history can be learned the frequency of the attacks of pain, its nature, the part of the abdomen to which the pain is referred; whether it is confined to one point or shifts; whether or not it occurred after the ingestion of a heavy meal, exposure to cold, or during the period of digestion, or after unusual movement or position or indirect violence. The degree of illness following must be ascertained as well as the tendency of the patient to constipation or diarrhœa. During or following an acute exacerbation of pain due to movable kidney, occurring in either a nervous or robust individual, local examination will show pronounced rigidity of the overlying abdominal wall, with tenderness, the degree of which is in direct proportion to the muscular rigidity.

The important differential points between appendicitis

and movable kidney are these: in appendicitis we have the sudden onset of acute abdominal pain, most commonly following the partaking of indigestible foods, and which, at first, is referred to the epigastrium or to the region of the umbilicus, and later becomes localized in the right iliac fossa. The presence of fever and an increased pulse-rate are more indicative of appendicitis. Also in appendicitis, the rigidity of the lower portion of the right rectus muscle, and the flat muscles of the abdominal wall immediately overlying the inflamed organ, differs from the rigidity present in movable kidney in that it does not involve so much area. The presence of a most acute tender point, which corresponds to the position of the inflamed appendix, is, at least early in the inflammation, more circumscribed than the tenderness in movable kidney. The tender area over a movable kidney is not so painful to slight pressure and extends over a greater area. The pain which, as a rule, is not so intense is at once referred to the site of the kidney or is reflected along the course of the ureter. Movable kidney, attended by both pain and rigidity, requires very delicate manipulation to detect it. By having the patient breathe with the mouth open, and with the thighs slightly flexed upon the abdomen, gentle pressure enables us to detect the kidney slipping away from the examining finger. There are cases, however, where nothing short of anæsthesia will clear up the question of a movable kidney. The presence of nausea, extending over days, is one of the most prominent symptoms in certain cases of movable kidney.

The operator may be thrown off his guard by acute indigestion occurring in a nervous individual suffering at the same time from acute paroxysms of pain due to a movable kidney, which was previously not known to the patient or to the physician. Under these circumstances the kidney may become temporarily anchored in its abnormal position. Under the foregoing conditions I have been called to operate for acute appendicitis, but could not say definitely that the case was not acute appendicitis until the patient was fully anæs-

thetized; then upon palpation the diagnosis at once became clear. Again, in the presence of both conditions—*i.e.*, movable kidney with acute symptoms and an enlarged appendix due to chronic inflammation—examination under ether will disclose not only the abnormal condition of the kidney, but also the presence of a palpably enlarged appendix. If under these circumstances the patient has been suitably prepared, an appendical operation should be performed. The operator, whose experience in appendical work has been rich, can usually say, upon what to the by-stander seems to be a superficial examination of the belly wall, whether the case is one of movable kidney or appendicitis. On the same principle, in the presence of a peritonitis, the result of appendicitis, the every-day operator can often separate the operative from the non-operative cases merely by palpation of the belly wall.

That movable kidney is mistaken for nephritic colic is evidenced by reports of cases. The subsequent symptoms of the two conditions bear some resemblance to one another, I admit; yet, after careful examination, that they should be confounded, I confess, I cannot quite understand. The presence of a calculus in a movable kidney is a different matter entirely. A properly taken X-ray picture would settle this question. The point which clinches the diagnosis in the case of movable kidney is its detection; that this is possible there is no doubt. In very stout persons difficulty in detecting the movable organ is increased, but in my experience is made certain by the administration of an anæsthetic.

The author has not included the various types of movable kidney in this paper, as he believes it simplifies the subject to describe them *in toto,* as he has done.

The treatment of movable kidney resolves itself into palliative and curative.

Palliative treatment consists of attention to the general health, attention to digestion, the administration of tonics, hydrotherapeutic baths, general massage, and the adjustment of some form of support which will retain the organ in its normal position. As to the question of the proper form of

support or of retaining appliance, I confess that I have yet to see one which is satisfactory; in fact, it is my experience that these appliances are more harmful than useful, therefore, if the patient is a great sufferer, particularly from frequent attacks of paroxysmal pain attended by vomiting, rigidity of the overlying abdominal wall, etc., which I am constantly seeing confounded with appendicitis, I believe that operative treatment of a radical character is indicated, certainly in at least the majority of these cases. Many different operative procedures are advised for the correction of this deformity, among the most important of which are stitching the kidney fast by carrying sutures through its capsule and substance, by dividing its capsule and stitching capsule fast, and by transplanting the kidney, as it were, an operation which has been recently advocated. As I have operated upon several cases of movable kidney and have seen the disastrous results of some of the forms of operation, I unhesitatingly put myself on record in favor of anchoring the kidney by gauze packing, as I will describe, and against suturing, particularly when the kidney substance is trespassed upon. Unfortunately, I have seen treated one case of movable kidney by suture, and in this case subsequent abscess-formation resulted consequent upon urinary infiltration into the substance of the organ through puncture of the uriniferous tubules with the needle. In this case it was finally necessary to perform nephrectomy. I would, therefore, raise my voice against any operative procedure which punctures the substance of the organ, and with more substantial reason, since I can bear witness to good results obtained by the gauze-packing method. The operation which the writer invariably performs was suggested to him two years ago by Dr. Nicholas Senn, but does not in detail correspond with the Senn operation.

The kidney is reposited in the loin-space and held *in situ* by an assistant.

A vertical incision, three to four inches in length, is carried through the loin-space of the affected side and the perirenal fat exposed. This consists of two layers, the adipose

layer proper and the fibrous layer, which closely resemble the parietal peritoneum. The outer layer of the fat is carefully dissected off. To accomplish this I frequently entirely deliver the organ. All of the posterior part of the fatty capsule is cut away and that of the anterior part as far as the hilus. The capsule proper of the kidney is next carefully scarified with the scalpel, not trespassing upon the kidney substance. Two long pieces of gauze are now selected, one is passed beneath each pole of the kidney, and the organ is reposited. With the organ *in situ* and the pieces of gauze carried beneath the poles protruding from the wound, more gauze is gently packed around and over the kidney, between it and the pieces of gauze first introduced. Over the gauze packing the first or long strips of gauze are tied, and a large gauze pad is placed upon the anterior abdominal wall over the site of the kidney. The wound is dressed and the dressing and anterior gauze pad are securely held in place by a strip of adhesive plaster carried around the abdomen. Over the pad of gauze and the gauze covering the wound an additional dressing is applied, and retained by a few circular turns of a bandage. This operation is not difficult, and requires but ten to fifteen minutes. The patient is made to assume the supine position. At the end of a week or ten days the gauze is removed, and the bed of the kidney and the surface of the organ will be found to be studded with healthy granulation. The wound is washed out with sterile water or a weak solution of bichloride, to which is added carbolic acid. The wound is gently repacked and dressed after the usual manner. The wound heals completely in from four to five weeks. I commend this operation as I have had a number of cases, a large percentage of which I have seen frequently since the day of operation, and the result in all is most satisfactory.

I have had the opportunity of a still better test than that of inspection and questioning the patient,—namely, that of palpating the organ from within the abdominal cavity when performing a subsequent operation for an entirely different condition. Here I found the kidney occupying its bed, which

proved to me that the ultimate results from this procedure would be good.

Relative to the question of suture of the kidney or its divided capsule, I do not for one instant think that the sutures play any part in the retention of the organ, other than through resulting inflammation and the inflammatory deposit consequent upon their introduction. In other words, I believe that the manner in which the kidney is permanently fixed in its bed in the few instances of relief which follow these procedures, is the same as that following the operation recommended,—namely, inflammation, granulation, etc. I believe, further, that the manipulation to which the organ is exposed in carrying out the suture process is more responsible for the ultimate anchoring than is the introduction of sutures. Again, the operation recommended in this paper does not expose the organ to the injurious effects of urinary extravasations, which occurred in the experience of the author, and also in that of Mr. Christopher Heath, who, Dr. Keen tells me, has discarded the operation of suturing the kidney for these reasons.

That the presence of sutures in themselves play no part in retaining the kidney can be demonstrated by carrying two or more of these through the kidney and holding the organ up by either end of the suture, when it will be seen that the weight of the organ is sufficient to cut the sutures out. Again, those of us who see a large number of these cases know too well that a recurrence of the deformity after the suturing operation is not uncommon. One of the first cases that the writer has seen was in the care of the late D. Hayes Agnew. Six months after the operation of nephrorrhaphy I saw this distinguished surgeon remove the organ for displacement, because of return of the symptoms for which the first operation was performed.

The report of cases of movable kidney herewith appended include only those which have been treated after the method advocated by the writer in the paper under discussion.

CASE I.—Miss N., aged twenty-four years; neurasthenic. Has had attacks of kidney colic. Right kidney affected. Operation, March 3, 1898. Packing removed and redressed. On sixth day, subsequent dressing at intervals for three days, until wound closed. Discharged cured.

CASE II.—Mrs. C. K., aged fifty-seven years. Admitted to the German Hospital February 10, 1898. Had complained of pain in left side and loin for two years, when lying down, standing, and walking. The pain came on suddenly after lifting a heavy burden. For some weeks noticed a movable mass in left iliac fosssa, moving with diaphragm, also on standing up. On examination the mass can be felt falling downward and forward on assuming the upright position. Tender to touch. During the last two years has had trouble with her bladder; frequent urination, alternating with attacks of retention. Operation February 12, 1898. Packing removed on the sixth day. Redressed every third day. Discharged cured.

CASE III.—J. M., aged twenty-six years. Admitted to the German Hospital February 7, 1898. For three months had complained of considerable pain in epigastrium, shifting to right loin and liver area. Had been quite nervous during this period. Examination revealed a mass moving downward with inspiration, and which could be reposited in loin-space. Operation February 9, 1898. Outside dressings changed on third day. Under ether the gauze packing was removed on seventh day. Redressed every third or fourth day. Discharged cured.

CASE IV.—M. B., aged thirty years. Admitted to the German Hospital June 1, 1897. Examination: Kidney palpated; tender and distinctly movable. Disappears entirely when patient assumes position on left side. Operation June 6, 1897. Gauze removed on seventh day. Kidney in good position in bottom of wound, apparently well anchored.

CASE V.—L. A., aged twenty-four years. Admitted to the German Hospital July 1, 1897. At the age of fourteen she first felt a pain in right side below costal border. Has had it on and off ever since then, accompanied by backache and pains in thighs. Had little nausea or vomiting. Three months ago a movable kidney was discovered. Patient had lost flesh and strength. Operation July 6, 1897. Gauze removed on sixth day. Redressed. Kidney in good position. On thirteenth day kidney

well anchored. On thirty-second day discharged. Kidney in good position, firm.

CASE VI.—A. L., aged thirty-four years. Admitted to the German Hospital February 11, 1898. When a child was injured in the right side, and ever since then has had dragging pain in right loin-space and right iliac fossa, increasing as the years passed. During the last four or five years it has been quite severe, giving rise to digestive disturbances, nausea, vomiting, constipation, and loss of appetite. Has become emaciated. A movable tumor can be felt in right iliac fossa and reposited in right loin-space. Tender to touch. Palpation produces nausea. February 24: Operation. February 26: Dressed. Outside dressings only removed. March 24: Patient has been redressed every three or four days. March 26: Patient allowed to get out of bed. April 4: Wound completely healed. Recovery.

CASE VII.—W. W., aged twenty years. Admitted to the German Hospital October 30, 1897. Has been sickly all her life. Had a severe fall five years ago. Two years later noticed a movable mass in right side of abdomen, tender to touch. Has had nausea and vomiting since the mass made its appearance. Stomach was very irritable; could retain little food. November 2: Operation. November 7: Gauze removed. Another piece packed under kidney and around it. Granulating well. November14: Dressed again, the same done as at first dressing. Wound filling in. Kidney apparently well anchored. December 9: Discharged after repeated dressings. Wound now almost closed. Kidney firm in place.

CASE VIII.—C. H., aged twenty-four years. Admitted to the German Hospital December 3, 1898. Present condition: One of four months' duration, when she had a dull pain on the right side below the ribs, this gradually increased in severity. She felt a swelling in the same position, which was movable. About two months ago had another attack, which lasted about a week. She says she remembers having several atttacks of pain before she discovered the swelling, but always attributed them to dyspepsia. When she turns from one side to another she feels the kidney moving, which gives a dull pain. She has never had any sharp pain and has never vomited with an attack. There has been no vesical disturbance. The kidney is distinctly felt on the right

side and is freely movable. It is tender to touch. Operation: Kidney anchored in position. Discharged cured.

CASE IX.—E. P. C., aged thirty years. Admitted to the German Hospital October 31, 1898. A week ago the patient's attention was drawn to the abdomen, when he noticed a movable mass in right loin-space and iliac fossa. Tumor was freely movable, and could be pushed back into the loin-space and retained there. The mass was quite tender to touch.. Numbness was felt by the patient in right kidney-space when on his feet a long time, also a sensation of weight and dragging in right side of abdomen on standing up. November 1, 1897: Operation. November 5: Gauze removed. Repacked. Dressed every week. December 1: Wound granulating nicely. December 14: Wound about half inch deep, two inches long. Nitrate of silver, 10-per-cent. solution, applied. December 18: Patient feeling very well.

DISCUSSION.

DR. HARTE referred to the practice of Mr. Morris, who was very strongly in favor of using the suture for fixing the kidney in the loin. Regarding the operation described by Dr. Deaver, the speaker had a number of times done practically the same operation, varying slightly in details only. The operation was not original with Dr. Senn, but had been taken from the German. He had followed up these cases, and he agreed with Dr. Deaver that it is the most satisfactory means we have of fixing the kidney in its normal place. He had tried suturing, and did not think that to be a rational operation, because it exposes the kidney to certain dangers. If the operation under discussion is done in a half-hearted sort of way one is bound to have a failure, just as in a hernia operation; but if one cleans out all the perirenal fat, getting good fresh surfaces in the kidney and loin, and then incises the surface of the kidney—the capsule—so that in the course of forty-eight hours a certain number of granulations will start up, and then does the same thing with the posterior wall of the loin, the surgeon will surely have a condition in which the kidney is moored firmly in position. He had followed up the cases that he had done, and his results had been satisfactory. He thought this to be the most rational operation of fixing the kidney.

DR. TAYLOR said that in many cases that he had seen, where

the kidneys had been sutured in place, there had been a persistent pain for a number of weeks, sometimes for months, a presumable pinching of a nerve. He inquired whether in the cases that Dr. Deaver had had he had ever met that condition.

Dr. J. Chalmers Da Costa said that a clearer distinction should be made between the two sorts of movable kidney. The mere fact that a kidney is movable should not be considered as ample justification for interference, and yet he thought the idea had gone abroad that, if a movable kidney is found in an individual, some sort of an operation must be done. On several occasions he operated in individuals who had been very neurasthenic, and at the same time suffered from a slight degree of movable kidney. It is not to be conceived that mere fixation of a kidney is going to benefit neurasthenia. The fact that a normal kidney is movable to a certain degree is generally recognized, and the question should be, Is this movability sufficient either to endanger the functions of the kidney or interfere greatly with health or with the comfort of the individual.

In regard to the operation of suture, he had been much dissatisfied with it. He had tried several methods, but had been so dissatisfied in anchoring the kidney by sutures that he had not resorted to it in the past year. He had heard Watson Cheyne say that one may anchor kidneys ever so carefully, but they are apt to get loose again. He had read articles in which it was said that the kidney does not get loose, but whenever he talked to individual operators he found that a very considerable percentage of kidneys do get loose.

Dr. T. S. K. Morton said that until surgeons learn something more in the way of treating another condition of which "loose" kidney is usually but one part, they will not get uniform results from any operation on the displaced kidney. The contributions to literature during the last two or three years have shown pretty clearly that "loose" kidneys, as a rule, are simply a part of a more or less general loosening of the abdominal organs (ptosis), and that while a certain proportion would be benefited by anchoring the kidney, the signs and symptoms springing from a disordered position of the abdominal viscera not rarely recur after the rest-cure involved in the after-treatment incident to anchoring of the kidney has lost its temporary beneficial effect. In the treatment of this ptosis of the abdominal viscera will be

found the secret, if there is any, for the getting of uniformly good results in floating kidney.

DR. DEAVER, in answer to Dr. Taylor's question, replied that; with one exception among twelve or fifteen of these operations, he had never seen pain except as the result of dressing the wound. This pain is but temporary, and it so happened in that case he had tried to hasten the process; for two or three days the girl had some pain with a little elevation of temperature. He naturally thought there was a focus of suppuration; but, upon examination of the wound, could not find any. At the end of two or three days the temperature reached normal, and the patient ceased to have pain.

The pain to which Dr. Taylor referred he believed to be due to traumatic neuritis consequent upon injury of nerves at time of operation. In the dissection for the exposure of the kidney he was careful to avoid nerve injury.

Relative to Dr. Da Costa's remark, he had avoided speaking of the different varieties of movable kidney, because he had not wanted to make a distinction between floating kidney and movable kidney, as he thought that the fewer terms were used the more practical the subject would be made. He specifically stated in his paper that movable kidney, which causes symptoms of acute abdominal pain, rigidity of the overlying abdominal muscles, etc., were the only cases in which he advised operation.

He had also borne in mind the likelihood of general dropping of the viscera. He had invariably examined his patients for this condition.

CARCINOMA OF THE FUNDUS UTERI.

DR. CHARLES B. PENROSE read a paper with the above title.

NOTES ON CANCER OF THE FUNDUS UTERI.

By CHARLES B. PENROSE, M.D.,

PROFESSOR OF GYNÆCOLOGY, UNIVERSITY OF PENNSYLVANIA.

During the four years 1894, 1895, 1896, and 1897 I have had an opportunity of observing eleven cases of cancer of the fundus uteri.

It is said in some of the works on gynæcology, such as Hart and Barbour, that cancer of the fundus uteri occurs in a proportion of 2 per cent. of cancer of the cervix. This I have never found to be the case, and I believe that the observers who made such records must have failed to recognize many cases of cancer of the fundus. In my experience at the Gynécéan Hospital, and at the University Hospital, the percentage of cases of cancer of the fundus is very much greater than 2 per cent. In the period during which I have observed the eleven cases of cancer of the fundus here reported I have records of sixty-seven cases of cancer of the cervix, therefore, in my experience, cancer of the fundus has occurred in the proportion of 16 per cent.

In looking over my case-books, in order to determine the total number of cases of cancer of the fundus uteri, I have been forcibly struck by one fact of great interest, and that is, the rapid diminution, in my experience at both the University and the Gynécéan Hospitals, of cancer of the cervix. In my last case-book, in which the records of 250 patients are kept, I find only eleven cases of cancer of the cervix. In the case-book immediately preceding this, containing also 250 patients, I find twenty-seven cases of cancer of the cervix. Many of my friends in gynæcological practice have spoken to me of a similar diminution in the number of cases of cancer of the cervix which now come under their observation. As

I believe that the total number of cases of cancer of all kinds is increasing at a rather rapid rate, I think that we must attribute this diminution in the number of cases of cancer of the cervix to the fact of the very wide use of the operation of trachelorrhaphy.

My cases of cancer of the fundus uteri may be briefly recorded as follows:

CASE I.—W. R., complete abdominal hysterectomy, March 13, 1894. Now in good health with no signs of recurrence.

CASE II.—D. H., complete abdominal hysterectomy, October 25, 1895. No recurrence.

CASE III.—A. P., abdominal hysterectomy complete, March 24, 1896. No recurrence.

CASE IV.—L. H., complete abdominal hysterectomy, May 24, 1896. No recurrence.

CASE V.—Mrs. S., complete abdominal hysterectomy, February 13, 1897. No recurrence.

CASE VI.—R. R., complete abdominal hysterectomy, March 10, 1897. No recurrence.

CASE VII.—E. B., complete abdominal hysterectomy (operation by Dr. Braldy), January 5, 1897. No recurrence.

CASE VIII.—S. S., refused operation, September 11, 1895. Died of exhaustion several months later.

CASE IX.—M. F., cœliotomy, October 13, 1893. Case found to be inoperable on account of intestinal involvement. Died of exhaustion several months later.

CASE X.—R. D., cœliotomy, inoperable. Died of exhaustion in few months.

CASE XI.—D. B., October 1, 1897, incurably insane. No operation considered advisable. Still living.

It will be observed that seven of the eleven cases were submitted to operation. The first operation was performed five years ago, and the last operation was performed about two years ago. All the patients recovered from operation. I have, during the past two weeks, heard from all of these women and from the attending physicians of most of them. They are all in good health, with no indications whatever of a recurrence of the disease.

The ultimate results in operation for cancer of the fundus, as illustrated by the cases which I have reported, are certainly very much more favorable than the results of operation in cancer of the cervix, and I think that these results in cancer of the fundus are superior to the results in operation for malignant disease in any other part of the body.

In my experience with hysterectomy for cancer of the cervix, the results have been most unsatisfactory. I have the record of one patient, where the disease primarily affected the mucous membrane of the cervical canal and had not extended through the body of the cervix, on whom hysterectomy was performed, and no recurrence had taken place at the end of two and one-half years. In another case of cancer affecting the vaginal aspect of the cervix and a portion of the anterior vaginal wall, in which the uterus and part of the bladder was removed, there was no recurrence of the disease at the end of three years, when I closed by plastic operation the opening of the bladder. With the exception of these two cases, I can recall no other patient in whom recurrence has not taken place.

OPERATIONS FOR HARELIP.

Dr. J. Ewing Mears presented a series of photographs (Figs. 1, 2, and 3) showing double harelip, with protrusion of the intermaxillary bone, occurring in a lad of eight years of age, and also the results obtained by operation. In this case he removed a small wedge-shaped piece from the posterior surface of the protruding intermaxillary bone, and forced the bone back into

Fig. 1.—Showing double harelip, with protrusion of the intermaxillary bone. Front view.

position in the cleft which existed in the alveolar process, having previously freshened the edges of the bone and of the process. He then wired the bone in position and completed the operation by closing the double cleft in the lip.

He called attention to the method of operation which avoids excision of the protruding intermaxillary bone. Excision of the bone was recommended by Sir Wm. Ferguson and practised by

FIG. 3.—Showing ultimate results after operation.

FIG. 2.—Showing side of the same case.

him in his operations, the reason being given for this method that the incisor teeth will grow backward into the mouth, and thus prove a source of annoyance. In the cases which have come under his observation he had not found this to be the fact, and, further, he had gained what he considered decided advantages in perfecting the operation upon the lip as well as upon the hard palate, which is involved in these cases. If the projecting intermaxillary bone is rudimentary, of course it is desirable to remove it.

Several cases had been sent to him for operation upon the palate in which the protruding intermaxillary bone had been removed. He had observed, in these cases, a failure to secure as good results in repair of the cleft of the lip as when the bone is permitted to remain in position, and he had also encountered difficulties in obtaining closure of the cleft in the hard palate by reason of the absence of the bone.

DR. WHARTON said that he had formerly employed the method of excising the maxillary bone, but recently had given it up. He had found that it left a very large gap and made it difficult to close the palate, and closure of the lip is interfered with. In cases which had come under his care recently, he had freshened the edges of the intermaxillary bone and that of the alveolus, and wired them. In some cases the intermaxillary bone is broken, in others he divided it partially with an osteotome, and then bent it into place. He had generally succeeded in wiring the intermaxillary bone in a fair position, with the result that the deformity of the lip was much improved. He thought that when these cases come to operation for cleft palate, it will be found that the correction of the deformity is very much improved by this procedure.

TRANSACTIONS OF THE PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, April 3, 1899.

The President, J. EWING MEARS, M.D., in the Chair.

A COMPARISON OF THE MERITS OF SUPRAPUBIC AND PERINEAL CYSTOTOMY.

BY NATHANIEL PENDLETON DANDRIDGE, M.D.,

OF CINCINNATI,

PROFESSOR OF SURGERY IN THE MIAMI MEDICAL COLLEGE.

I SHALL endeavor in the following paper to estimate the relative advantages of the suprapubic and perineal routes in the various conditions for which the bladder must be opened, and seek to determine whether the now fashionable high operation has not made us over-estimate the value of the former, and led us to under-estimate the advantages of the latter.

The great expansion of the surgery of the urinary apparatus in man is not the least interesting of the advances made during the present generation, and the wider field now offered for interference has naturally brought to the front new methods and led to the expansion of older ones to meet the requirements of our bolder attitude in approaching the relief of these affections. It may be well to recall at the outset—though the history is so recent that it is well known—the conditions which have led to the present prominence of the suprapubic operation.

The publication of the anatomical studies of Garson, in 1878, showing the relation which exists between that portion of the anterior wall of the distended bladder uncovered by peritoneum and the abdominal wall,—when at the same time

the rectum is distended,—and the paper of Petersen, in 1880, showing the application of these facts to suprapubic cystotomy, are the well-defined dates for the new departure in bladder surgery. The recent expansion of peritoneal surgery in which the abdominal wall had been so freely and safely incised, and which had shown how fully the dangers from peritonitis could be discounted, undoubtedly had a determining effect in influencing the immediate general adoption of the high operation. The facility with which the operation could be performed, and the satisfactory access which it gave to the bladder, to both sight and touch,—and the marked extension which it afforded to manipulations within its cavity, all gave a decided impulse to its popularity, and its adoption at once widened out the field of operative activity in vesical surgery.

The natural limitations of perineal cystotomy, the imperfect manner in which it afforded an opportunity for exploring the bladder, and the restricted limits which it placed upon manipulation for the removal of foreign bodies, or morbid growths, were all additional arguments for the adoption of another method and another route by which the much-desired freer access to this region could be obtained.

Cystotomy up to the time of Petersen's paper had been confined to the extraction of stone, the occasional removal of an outgrowth from prostate and base of bladder, or for puncture for retention, and the new method at once afforded an opportunity for expansion in operative interference,—an opportunity which operators were not slow to improve,—and it was natural and proper, indeed it was inevitable, that it should be pushed to its utmost limits.

Tumors were at once removed, and the prostate was attacked in a manner unheard of before, and at the same time it was applied by many in place of the better known forms of perineal lithotomy for the removal of stones,—large and small, and in young and old alike, and became a favorite method of dealing with obstruction, needing temporary or permanent drainage.

The history of suprapubic cystotomy is of interest, showing as it does such a varying degree of popularity, from time to time, since its introduction by Franco, in 1556. It has been taken up and its advantages advocated by individual surgeons, without, however, securing any general adoption until the present. Cheselden practised it with success for a time, and then, without any definite reason being assigned, turned to lateral lithotomy, which he continued to employ until his death.

During the early part of this century the high operation for stone had strong advocates in France,—Dupuytren, Scarpa, and Soubierbeille being among those who championed its cause,—and proclaimed its merits, without, however, commanding a general following in their own or foreign countries, though here and there it was adopted in isolated cases of very large stones, or for the removal of foreign bodies.

It is of interest in this connection to recall the paper of Dr. Dulles, in 1875, setting forth the advantages of the high operation from the analysis of nearly 500 cases collected from various records. A comparison of the perineal and suprapubic routes to the bladder reveal dangers and difficulties in both, though in both it may be said that they are the exception. In both the condition of the kidneys dominates and controls largely the mortality, and determines the degree and intensity of operative shock. Hæmorrhage may be encountered in both, but is seldom serious or difficult to control in either.

The possible injury and occlusion of the ejaculatory ducts and the wounding of the rectum are peculiar to the perineal operations. The published facts bearing on the first subject are, however, extremely limited in number, while wounding of the rectum rarely occurs, and when it does occur is seldom of serious import.

On the other hand, the much-feared danger of infiltration of urine after opening the prevesical space in the suprapubic operation can be safely ignored, and the danger of peritonitis, while by no means absent, can usually be provided against even when the cavity is opened by accident, or intentionally.

It may be said that there is now among surgeons a practical unanimity as to the best method of performing both median and lateral perineal cystotomy, and that there is no further room for discussion on this score. On the other hand, the best method of performing the high operation is still the subject of animated discussion, and new suggestions are constantly being made for the improvement of the technique of every step.

The usual median incision of the abdominal wall and bladder has been supplemented by the transverse incision of one or both of these structures. The distention of the rectum by the rubber bag, considered essential by Petersen and his followers, has been discarded by many as dangerous on account of rupture, and the Trendelenburg position adopted as safer and as answering in every way the same purpose.

The distention of the bladder by water, it is now claimed, is less effective and more dangerous than air distention, which is strongly advocated as the better and safer.

The relative merits of leaving open, or sewing up, the wound in the vesical wall is still undetermined, and both methods have their advocates.

The best manner of draining the bladder is still discussed, and new suggestions are constantly being offered,—whether drainage should take place simply by overflow, by single or double tube, or by a system of siphonage, constant or intermittent. In no step of the entire operation has any single method met with general concurrence and approval, and in every one there is at least one alternative. This in itself is an indication that each of the various methods and modifications leave something to be desired, and is a curious if not a more significant fact in connection with an operation so often performed in the last twenty years as suprapubic cystotomy

Of the two operations, unexpected difficulties may, I think, be said to be more likely to occur in the suprapubic than in the perineal operation, and statistics I consider certainly prove that the high operation is the more fatal in conditions of like gravity and severity. In successful cases the

wound is longer in healing. The patient requires more care and attention, and a permanent fistula is more likely to occur, and even when healing has once taken place a breaking out again occurs more often than in the perineal operation.

Furthermore, the fixation of the bladder to the abdominal wall is likely to impair the natural concentric contraction of the vesical wall upon the urethral outlet as a centre which is so important to the complete evacuation in the normal bladder. It is this imperfect concentric contraction which is to be charged with the occurrence of residual urine, and cystitis when the natural channel resumes its functions after suprapubic cystotomy. The perineal opening is free from this objection.

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As Diday says of his own case, in another sense, however, "Dieu fit bien ce qu'il fit."

Nature intended that the urine should escape beneath the pubis in man, and demands a serious price when it becomes necessary to ignore this law.

Auneau has studied in an interesting thesis the immediate and later results of the suprapubic opening. The immediate effect upon the bladder he finds most satisfactory. The purulent urine becomes clear, and the mucous membrane returns to its normal condition. To quote the words of Poncet, the bladder of an old man resumes the condition of youth. The artificial channel, however, preserves the conditions of a fistula, and in no way assumes the function of a urethra. It may be guarded to some extent by the voluntary muscles through which it passes, but the sphincter action of the vesical involuntary muscles which has been claimed is entirely wanting, and this irrespective of the various modifications which have been suggested. The surgeon is not master of the function of the channel he has created. Incontinence is the rule with continuous escape of urine, or possibly the intermittent escape by catheter, or overflow, after a small amount has collected in the bladder. Voluntary control and micturition are the great exception. Continence after suprapubic cystotomy, he says, in the experience of Paris surgeons still remains a

myth, and the continuous flow of urine which at first was the patient's salvation soon becomes the source of the greatest distress.

Drainage is an important factor in nearly all operations upon the bladder. It is indicated for the relief or prevention of cystitis, or to substitute an artificial outlet for the natural channel, which may have become more or less completely, and either temporarily or permanently obstructed, and in cases in which the use of the catheter has become painful and difficult. Cystitis following obstruction is the condition most frequently demanding drainage. "As predisposing causes of cystitis we recognize," to quote from Senn, " such injurious agencies and influences as are concerned in establishing a *locus minoris resistentiæ* in the tissues of the bladder, in which a sufficient number of pathogenic microbes of adequate violence accumulate to produce those tissue-changes which characterize inflammation."

Cystitis is always due to the presence of infecting germs. Micro-organisms may be carried to the bladder by illy cleaned instruments, which may also be the cause of the no less necessary traumatism, or they may gain entrance by the simple extension of a disease process along the natural channels, the urethra being more often responsible than the ureter. The passage of germs by the lymph-channels must also be recognized as a not infrequent cause of infection from adjacent lesions. " The ordinary pyogenic organisms are only capable of producing cystitis in the presence of favorable conditions; certain organisms, however, that possess the power of breaking up urea and extremely virulent cultures of the bacillus coli are exceptions. These need no accessory or predisposing cause. The urobacillus liquefaciens septicus and the staphylococcus pyogenes are two of these."

" Everything that interferes with the circulation through the bladder, or the prostatic portion of the urethra, favors the occurrence of cystitis." (Moullin.)

This explains its frequent occurrence in stricture, and hypertrophy of prostate with its residual urine, and passive

congestion of the vesical mucous membrane. Retention alone will not cause it, even when a large amount of residual urine is habitually retained, but furnishes a soil most favorable for the growth of micro-organisms even when present to a slight degree. Stone will not cause it alone, but the irritation and local traumatism which follow its presence are powerful adjuncts to the action of living organisms.

"In suppurative cystitis the bladder contains myriads of septic organisms which grow and thrive in the urine and pour their poisonous products into it. If the attack lasts for any length of time, or if the micro-organisms are assisted by the presence of some additional irritant, such as a foreign body or a calculus, they spread through the protecting epithelial layer and involve the wall of the bladder, too." (Moullin.)

The cavity may be distended, the walls flaccid or thin, and perfectly tolerant of large quantities of urine, or the walls may be thickened, and contracted so that the bladder capacity may be reduced to one or two ounces, and intolerant of the smallest amount. The cavity may present a condition of sacculation, pouch-like dilatations extending out between the muscular bundles, quite incapable of emptying themselves. The deep pouch which forms behind the prostate, and below the urethral outlet, is well known.

The reaction of the urine has an important bearing on drainage. In ammoniacal urine the tenacious glairy deposit of pus with the incrustation of the mucous membrane with phosphatic salts presents a condition much more difficult of removal by drainage than acid urine with its lighter flocculent deposit.

Those bladders are most effectively drained in which the cavity retains its natural form and its walls are still able to expel its contents; while the bladders of irregular shape and thickened walls yield much less readily to its influence, and in such, complete restoration of function is less likely to follow. In these cases, however, drainage may establish a painless mode of exit, and by keeping the bladder empty remove the conditions favorable for germ action,—namely, conges-

tion of the mucous membrane, and the liberation of ammonia from decomposition of urea, and the power of contraction may again return to a bladder which had apparently lost it entirely. In many cases of cystitis the simple removal of the predisposing irritant, such as a stone, or of an obstruction, such as a stricture, may be all that is necessary to remove the morbid state due to infection. The bladder now contracts and expels the germ-laden urine, and the mucous membrane rapidly regains its normal condition. In more advanced cases the same result may be obtained by careful and frequent washing with disinfectants, so as to destroy and remove the morbid germs and their products. "When, however, one has exhausted the large resources of catheterism, when the bladder becomes intolerant, when in spite of injections clear urine is no longer obtained, when the patient begins to be infected, cystotomy finds its indication, and should prove a means of great benefit." (Routier.)

In cystitis following stricture even of high grade, perineal drainage following an external urethrotomy is so eminently successful that the advantage of a suprapubic opening, while it has been suggested, has never been seriously considered.

In hypertrophy of the prostate an opening into the bladder may be demanded for an acute retention which cannot be relieved by the catheter, or the use of the aspirator. It may be called for on account of frequent and painful catheterization, or to prevent or relieve a cystitis, either with or without symptoms of general infection. In these cases the perineal route offers certain definite advantages. It is the operation of least danger, most rapid and easiest of execution. The opening is best placed for drainage at the lowest part of the bladder, and it further, in many cases, affords an opportunity, without in any way increasing the danger, of securing a permanent relief by freely incising the obstructing part of the gland, and so cutting down the floor of the urethra to a level with the lowest part of the bladder, as first suggested by Harrison, and preventing recurrence by keeping a large-sized tube in place during the process of healing. These favorable

conditions can only be secured after a suprapubic cystotomy by an additional prostatectomy, which adds greatly to the severity of the operation. That drainage by a suprapubic opening is not satisfactory is shown by the fact that many operators supplement suprapubic prostatectomy by making a perineal opening just to secure a low-level drain. In this connection the names of Belfield, Keyes, and Cabot may be mentioned. It is of interest here to note the fact that Frere Come in performing suprapubic lithotomy began by a perineal incision through which he introduced the sonde-a-dard, and after completing the operation used the opening for the introduction of a drainage-tube. In acute retention, when repeated aspirations will not afford relief, the same reasoning would apply in giving the preference to the perineal operation.

I would, however, make an exception in favor of those cases of acute retention associated with a large hæmorrhage and coagulation of blood within the vesical cavity. Here, while the catheter may enter the bladder, it is immediately clogged with clot so that evacuation is impossible. In such cases the suprapubic opening affords decided advantages by getting rid, at once, of all the coagula. Here the pressing necessity outweighs the future advantage of the opening in the perineum. It must, however, be admitted that for purposes of exploration of the bladder cavity, the high operation possesses all the advantages, and for this purpose, with the admitted impossibility of always excluding such complications as stone or tumor, in advanced cystitis, it will at times be properly chosen, in order to place us in a position to at once deal with these conditions also if found to exist. Should, however, the case prove to be one for simple drainage, a perineal opening should at once be made in the majority of cases.

Of the relative advantages of a suprapubic or perineal opening in the bladder for permanent drainage, it is difficult to express a definite opinion, from a study of statistics or the expressions of authorities. Both routes have been used with advantage. Hunter McGuire and Poncet have been the chief

advocates for the first. McGuire especially has published an interesting series of cases in which voluntary control of the bladder existed with an opening above the pubis. I have not, however, been able to find the evidence that many others have been equally successful, and many who have tried it have expressed themselves illy satisfied with the result. When the patient is up and about, the opening will leak in the majority of cases, in spite of plugs and pads, and when necessary a rubber urinal is a veritable abomination. The perineal tube, on the other hand, is by no means easily borne; for, while it passes through the prostatic urethra, and is grasped by the muscles which close this channel, and so prevents leakage, it is apt to cause more or less pain and discomfort, both in sitting and walking. Should the time come, however, when the tube can be dispensed with, the comfort of the patient is much greater with the perineal opening, which soon becomes competent, except at the time of the voluntary evacuation of the bladder, while the suprapubic continues to leak, and be a source of annoyance until final closure, which is likely to be indefinitely delayed.

When the bladder must be open on account of obstructed or painful micturition in cases of cancer of the bladder, the high opening presents decided advantages. The growths are most often at the base of the bladder, and a perineal tube is likely to cause hæmorrhage, and the growth is likely to obstruct the opening into the bladder so that reintroduction of the tube becomes difficult. The high operation here presents decided advantage. In tuberculosis of the bladder general and hygienic measures should be given the preference to operative interference. Operation may be called for either to attempt direct treatment of the vesical lesion, or to secure relief from frequent and painful micturition. The suprapubic opening is here the better placed, and offers greater facility for inspection and treatment. I would draw, therefore, the following conclusions, that for the purpose of drainage perineal cystotomy presents advantages over the suprapubic:

(1) Because it drains more efficiently while the patient is in bed, and subjects him to less discomfort.

(2) The perineal wound heals more promptly and with less leakage than the suprapubic, if the tube can be withdrawn.

(3) It is less likely to offer difficulty, and its performance takes less time.

(4) It affords a better opportunity for permanently removing the cause of obstruction, and so securing a permanent relief without increasing in any way the danger.

(5) It is less likely to interfere with the restoration of normal contraction, and is in itself a less dangerous way of opening the bladder.

In cancer of the bladder, tuberculosis, and hæmorrhage, suprapubic cystotomy affords the greater advantage.

In discussing the relative merits of the high and perineal operations for stone, I may at the outset quote with entire approval the sentence with which Thompson opens his treatise on the suprapubic operation: "I think," he says, "that among experienced surgeons there will be little or no dissent from the proposition that the operation of lithotrity at a single sitting is, in fairly experienced hands, that which is best calculated to insure a successful result for nine cases out of ten of stone in the bladder occurring among male adults."

I would be understood, therefore, as considering that the operation of choice for the great majority of cases of stone in the bladder in adults is the crushing operation, and that no form of cutting operation can compare to it in safety and efficiency. Nor am I disposed to consider that organic disease of the kidneys, cystitis, or hypertrophy of the prostate, unless most marked, are to be considered in themselves a contraindication; while the experience of English surgeons in India has so far extended the age limit that children of all ages now may be said to come within its scope. Furthermore, the successful development of perineal lithotrity has so far extended the application of the crushing operation to stones of unusual size that it may be said that few calculi remain which must of necessity be subjected to a cutting operation. There still, however, exists a sufficient diversity of

opinion to furnish an ample opportunity for studying the results of the various forms of lithotomy.

Statistics all seem to prove that the high operation presents a much higher rate of mortality than the perineal, especially lateral lithotomy. This is much more marked in early life than in those over fifty. Barling has studied the results of stone operations in five years, from 1888 to 1892, in "six London and seven provincial hospitals, the majority being medical schools." One hundred and sixty-nine cases of suprapubic in all ages gave a mortality of twenty-six,—or 15.3 per cent.; while lateral lithotomy, with ninety-six cases, was fatal in five,—or less than 5 per cent.

In patients under twenty, the contrast is still more marked. In seventy-nine cases of suprapubic lithotomy, fifteen died,—or 19 per cent. Lateral lithotomy, in sixty-four cases, gave a mortality of 3 per cent.

It is of interest to note that the causes of death in the high operation were given as degeneration of kidneys, peritonitis, septicæmia, cellulitis, and secondary hæmorrhage.

Comparing the results for all cases of stone during these five years, including those submitted to lithotrity, with Thompson's well-known earlier tables, he finds that the latter give a mortality of 12.5 per cent., while the former only 10 per cent., showing a reduction of 2½ per cent., by which the general mortality of stone operations has been lowered in modern times. In children, however, the mortality has actually increased; Thompson showing a mortality of 6 per cent. and Barling's tables 8.4 per cent. This greater mortality is shown to be due to the suprapubic operation, as lithotrity in patients under twenty gave a mortality of only 2 per cent.

These statistics are said to include all of the cases of lithotomy in the above mentioned hospitals. Nearly two-thirds of the entire number were submitted to the high operation. This fact proves that the high mortality in modern cases is not due to the fact that only stones of unusual size were reserved for suprapubic lithotomy, as has so often been

claimed, for there is nothing to indicate that there was any difference in the cases submitted to the two forms of cutting operations. From these figures the conclusion seems inevitable that the high operation in average cases of stone in children furnishes a mortality vastly greater than the perineal operation.

The same relative mortality is further shown in the tables for suprapubic lithotomy given by Watson, in the "Text-Book of Genito-Urinary Surgery."

Two hundred and forty children give a mortality of 12 per cent.; twenty-seven adults give a mortality of 0 per cent.; nineteen old men give a mortality of 42.1 per cent.

The same author gives the mortality for perineal lithotomy as follows:

Three hundred and fifty-five children, a mortality of 3.1 per cent., as against 12 per cent.; seventy-nine adults, a mortality of 7.6 per cent., as against 0 per cent.; nineteen old men, a mortality of 15.7 per cent., as against 42.1 per cent.

The success in stone operations in the hands of the English surgeons in India is so extraordinary that it may be questioned whether their results are applicable to Europe and America.

The most recent statistics, said to be drawn from official sources, have been given by J. A. Cunningham (*British Medical Journal,* August 7, 1887):

Ten thousand and seventy-three cases of lithotrity, with a mortality of 3.96 per cent.; 7201 cases of lateral lithotomy, with a mortality of 11 per cent.; 147 cases of suprapubic, with a mortality of 42 per cent.

It is of interest to speculate on the causes of the unusual success in the crushing operation in India, so far is it beyond anything found elsewhere.

Freyer asserts that while the average is younger by some years than that given in Thompson's tables, the average size of the stones is larger. Personal dexterity, acquired by unusual experience, may play a certain *rôle.* It seems not unlikely that a part of this success may be due to the fact that

chloroform seems to be so much safer than in the more northern climates, and, further, to the fact that they are dealing with a population foreign to the use of all forms of alcohol, the habitual use of which is so potent an influence in producing those degenerative changes of the kidneys, and arterial system, which is so important a factor in the mortality rate of all forms of surgical interference with the urinary apparatus in man.

If we are to be guided by mortality tables it would seem to be probable that all forms of cutting operations will be still further restricted, and the cases for which the suprapubic operation is to be chosen should be extremely limited, and I should myself prefer the lateral operation for stones too hard to crush, except in case of very unusual size, from the larger mortality, the increased length of convalescence, the greater discomfort, and greater likelihood of a permanent fistula of the former method. I should myself consider that experience would indicate that the high operation should be confined to stones of most unusual size, to encysted stone, and to stones complicating tumors, and to cases of some deformity, such as ankylosis of the hip, and that hypertrophy of the prostate should only exceptionally demand it.

The operative procedures now offered for the relief of hypertrophy of the prostate present us with a veritable *embarras de choix*. It is not my purpose to discuss the merits of these various methods except so far as the perineal and suprapubic routes are concerned in prostatectomy.

It is essential, however, to refer to castration as a means of relief in these affections. The most recent statistics presented by the author of the operation are to be found in the "Text-Book of Genito-Urinary Diseases." Here are reported 107 recent cases not found in other reports. Of these twelve died,—a mortality of 11 per cent. Two of these deaths it is considered should not be counted, and this reduction would reduce the percentage to 8.5 per cent. The author says that in properly selected cases the death-rate should not be more than 5 per cent. Other authorities have estimated the mor-

tality, however, as high as 20 per cent. Cabot has calculated the percentage of cases decidedly improved as 80 per cent. of those surviving. The operation has been attended with such success that it has commended itself as the method of choice to many surgeons. There are many, however, whose experience would lead them to decidedly limit its application.

The recent reports of the Bottini operation would indicate that it is capable of dealing with a large proportion of cases of hypertrophy in a successful manner, even in the presence of desperate conditions.

In a recent report, by Meyer, in the *New York Medical Record,* 164 cases gave 75.5 per cent. as cured or much improved, with a total death-rate of 8 per cent., or of deaths due to the operation 5 per cent.

These results compare favorably with any of the operations recently advocated and now being tried, and a more extended employment will doubtless soon furnish us with the evidence to determine its advantages, and to fix its limitations.

It is not necessary to describe in detail the conditions of the prostate which cause changes in the bladder demanding relief. " It does not matter," says Moullin, " what part of the prostate is affected. It may be the median or the lateral lobes; it may be all three, or it may be the urethral portion only; wherever it occurs it obstructs the exit of the urine from the bladder and increases its work;" and, " every form interferes with the level of the floor of the bladder."

Operations are undertaken in hypertrophy either to remove the obstacle to urination, or to diminish the obstruction which exists to the introduction of the catheter (Vignard). Prostatectomy has now been submitted to trial by a large number of different surgeons, and the original operation has been variously modified to supply the deficiencies, and avoid the shortcomings of the method first suggested by Belfield and McGill. Its results have been greatly extolled, but a superficial knowledge only is needed of the cases reported to discover a decided want of unanimity in the expression of

approval and satisfaction. The relief has been far from complete, and the ultimate condition of the patient far from being all that is to be desired.

" So grave is it, and so far from being ideal in the results that it guarantees," says Keyes, " that we hear less of prostatectomy now than formerly. It is not now generally advocated by the Guyon school in France. The tendency there is to return to the catheter with asepsis."

It seems, however, in spite of such criticism, which is by no means isolated, that some form of prostatectomy is likely to remain as an acknowledged surgical procedure in dealing with the graver forms of hypertrophy that have passed beyond the power of the catheter to relieve.

A suprapubic opening has the advantage of giving a full view of obstructing bars, hypertrophied third lobes, and horse-collar overgrowths, and usually permits the removal of all parts presenting on the vesical side. By this means, partial or complete prostatectomy can be performed, though for the latter recent operators have found that they could derive great assistance by a perineal incision in addition.

Removal of a part or the whole of the gland by suprapubic prostatectomy is only effected by extensive laceration of the mucous membrane about the urethral opening, and by leaving exposed to the urine the cavity left by the tissue removed. It has the disadvantage of having the opening badly placed for drainage, and the hæmorrhage encountered has been severe and hard to control. So conspicuous have the defects been that it is now usual to supplement the suprapubic opening by a perineal incision. By this means hæmorrhage can be more easily controlled, and the necessary drainage more readily secured. It further greatly facilitates the removal of the gland by enabling the operator to push it more prominently into the vesical cavity, and so bring it within easy reach from above. This advantage is so decided that the opinion seems growing that partial removal—cutting away or gouging out presenting portions of the prostate—should only be attempted by the suprapubic opening alone.

In a considerable proportion of cases a fatal result has

ensued, and in no inconsiderable number the operation has failed entirely to secure a return of the power of emptying the bladder, while in others again this has been incomplete, with the evil consequences of residual urine and its resulting cystitis. Its mortality has recently been estimated by Cabot at 20 per cent., with marked relief of the symptoms of obstruction in 83 per cent. of those who survived, or 68.4 per cent. of those operated on,—a proportion less than reported as decidedly improved by the Bottini operation. A variety of perineal operations have been suggested for the complete removal of the prostate. Zuckerkandl, Dittel, Nicoll, and Alexander have all suggested different methods. Alexander's operation may be taken as likely to prove the most satisfactory of these. It may be characterized as a perineal operation with a complementary opening of the bladder above to facilitate the manipulation necessary for bringing the prostate within easy reach from below; just as the operation advocated by Belfield, Watson, and others, must be considered a suprapubic operation with the addition of a perineal opening for drainage, and to afford assistance in the removal of the gland from above.

In Alexander's operation the membranous urethra is alone opened, and the mucous membrane at the base of the bladder left entirely undisturbed, while the tube is best placed for drainage.

The opening above affords in addition every opportunity for exploring the bladder for stone or other complication. The results reported by the author indicate a satisfactory success. A sufficient number of cases by different surgeons have not yet been published to enable us to estimate its definite place in the relief of hypertrophy.

From the present trend of opinion it would seem not at all unlikely that, after all, the operation suggested years ago by Harrison may prove to be the most generally applicable for prostatic obstruction. It seems to have held its place in the estimation of surgeons in the face of the newer operations. It is little more than an external urethrotomy. The finger

carried through the prostatic urethra readily guides the knife to the obstructing mass in the middle, and the lobes on either side may be freely incised and a low level urethra secured, in the large majority of cases.

The perineal route would seem to possess certain decided advantages in cases of hypertrophy demanding operation. It affords the best drainage, it secures an easy introduction for the catheter, if further needed, even when it was most difficult before. It has the great advantage that it may be resorted to in extreme cases when drainage is urgently demanded, and is so rapidly completed that prolonged anæsthesia is avoided,—the greatest danger these cases have to encounter.

During the last twenty years the chapter on vesical tumors has been very fully elaborated. Their pathology and symptoms are now well known, and the data upon which their diagnosis can be made is generally recognized, so that it is unnecessary to dwell on this part of the subject. All forms of tumors are likely to be complicated by cystitis, either with or without stone, by which their recognition is often greatly obscured. Medical treatment and palliative injections are not likely to meet with much result.

Operation is indicated either for the removal of the growth or to provide a painless exit to the urine. Pain—and often of the most excruciating character—is one of the most constant symptoms, and obstruction, more or less complete, frequent when the growth is near the orifice of the urethra. Hæmorrhage may threaten life and demand operation for its control.

Perineal cystotomy has had some notable triumphs in dealing with tumors that were situated near the orifice of the urethra. It is, however, at best a haphazard proceeding.

For the removal of a tumor a suprapubic cystotomy is always indicated. The exploration of the bladder is facilitated, and the opening is so placed that the removal of pedunculated tumors is usually easy, and resection of more or less of the wall, if necessary, within reach.

I see little to commend in the very extensive operations involving most of the bladder with transplantation of the ureters. The removal of pedunculated tumors is usually easy and the result satisfactory. The manipulation must, however, often be made by touch alone, as the bladder fills so completely with blood that it is impossible to catch sight of the growth. The finger, however, can usually safely guide the forceps in removal.

Malignant disease most often involves the trigone, and is not infrequently an extension from the prostate. In these cases suffering is often extreme, and a permanent opening will afford great relief. A perineal opening is generally unfortunately placed, and the fungous growth which is likely to follow operation soon interferes with the flow of urine. A drainage-tube is likely to be painful and to provoke hæmorrhage. The suprapubic operation is better placed and of more enduring benefit.

DISCUSSION.

DR. J. WILLIAM WHITE said that, as to the technique of the two operations which Professor Dandridge had compared, he thought all would agree with him as to the method to be adopted in perineal lithotomy. That does not require discussion. As to the technique of suprapubic lithotomy, he could only say, after an experience of a number of years, that he had never found it necessary to resort to the transverse incision, the Trendelenburg posture, and a sufficient median incision having given him all the room he wanted for intravesical manipulations. So, too, he was content with distention of the bladder with an antiseptic fluid. He had never had occasion to change that to dilatation by air; and he still preferred to use the rectal bag, not so much for the purpose of bringing the bladder higher in the pelvis or making it an abdominal organ, as for giving it support during the manipulations necessary after it was opened. He did not regard it, as he once did, as essential to the operation, believing, as Dr. Dandridge had said, that it may be dispensed with if the patient is in the Trendelenburg posture. As to the fatality, which Dr. Dandridge, in a general way, said was greater after the suprapubic section, he saw no *a priori* reasons, given a certain class of cases and

comparing the mortality results after suprapubic and perineal operations; why the division of the tissues and opening the bladder above the pubes should be attended with any greater fatality than the division of the tissues and opening of the bladder below the pubes; it seemed to him that the statement required very careful consideration in regard to each particular class of cases, and should not be accepted as a general surgical rule in selecting these operations.

Taking up the particular points in the order which Dr. Dandridge had mentioned them, drainage of the bladder, if it is for obstruction, is usually for either urethral or prostatic obstruction. If urethral, he thought there was but little difference of opinion as to the propriety of adopting the perineal route for its relief. If the bladder is to be drained for conditions brought about by urethral obstruction, the perineal route offers an opportunity for the relief of the obstruction itself; if the obstruction is prostatic in origin, the perineal route has the advantage of producing an occasional cure. The method of Harrison, to which Dr. Dandridge had alluded, has been followed, in the cases reported by Harrison, by a cure more or less permanent. He thought, however, in cases with a deep posterior prostatic pouch, it was not so easy to plan the perineal operation with safety so that it should reach and drain the bottom of such a pouch, and he had found that suprapubic drainage, by one or other of the siphon methods, had, on the whole, given somewhat better results. He should be disposed, in operating entirely for drainage and where there was evidence of an existing deep prostatic pouch, to choose the suprapubic incision, followed by some method of siphon drainage. If one was certain of reaching such a pouch by the perineal route, it would probably be the method of choice; but one cannot be certain.

For cystitis, pure and simple, the perineal is undoubtedly the method of choice, but he did not think that the subject should be passed by without an allusion to the great neglect by the profession of the use of the permanent catheter. The general practitioner is too apt, in cases of cystitis, without a fair trial of continuous catheterization, to ask a surgeon to perform an operation for drainage, where the intelligent use of the permanent catheter (which can always be kept up for from three to five weeks, and frequently for a much longer time) would very often produce

such changes that no operation would be necessary. He made that remark on the basis of the cases that he saw in consultation, where he had found that the use of the permanent catheter is hardly considered, as a rule, by the medical attendants. If the rules laid down by Guyon and his school for the insertion and care of the catheter, its fixation in the proper position, bringing it not too far within the bladder, and for irrigation of the bladder through the catheter and of the urethra alongside of the catheter, are carried out, it will often enable one to dispense with every other method of drainage.

In operations for drainage in cystitis of the tubercular bladder, the suprapubic is almost always the method of choice. The lesions of tuberculosis of the bladder are apt to be about the vesical neck and base of the bladder (except when they involve the urethral orifices), and infection of the perineal wound is then certain to follow perineal drainage. The suprapubic method is also desirable because it offers an opportunity to treat the lesions directly, and is the method to be preferred, in his opinion.

When bleeding is the indication for drainage, the suprapubic method should be selected. The largest perineal tube is apt to be unsatisfactory in the presence of serious bleeding, the clots from which are much more easily disintegrated and removed through a suprapubic than through a perineal wound.

Permanent drainage of the bladder was, in his experience, unsatisfactory, whether suprapubic or perineal. So far as experience goes, he did not believe that he had any basis for choice. He had not liked the results whether the opening had been above or below the pubes. He thought it to be largely a matter of individual experience, and that there is no broad ground for choosing which route to select.

In regard to stone, which was the second subject taken up by Professor Dandridge, of course all agree that cystotomy of any kind should be done only in exceptional cases. Litholapaxy is the choice with surgeons the world over. As to the exceptional cases that were mentioned by Dr. Dandridge, he thought there was little or no ground for disagreement. Stone and big prostate conjoined (putting aside the operation of castration, which some surgeons would consider and others would not as likely to procure more favorable conditions by causing shrinkage of the prostate), if requiring cystotomy, would seem to be better dealt with by the suprapubic route, enabling one to remove the

stone and to satisfy one's self as to the condition of the prostate, and perhaps to supplement the cystotomy by a prostatectomy. If he had to give a rule, that would be the one he would lay down.

In encysted stone, unless it projects into the bladder and can be lifted out of its pouch with a scoop, the obvious advantages of the suprapubic method make it the operation of choice. In very large and hard stones, those that are not suitable for litholapaxy, the suprapubic has advantages over the perineal method, but he thought it to be open for consideration whether a combination of two methods—perineal lithotrity—will not supplement the suprapubic in these cases. Keith's results, and those of other English surgeons practising in India, have been so successful that most genito-urinary surgeons have their attention turned in that direction, and would, at least, consider the fragmentation of very large stones in the bladder through a perineal opening before deciding finally on a suprapubic operation.

There are certain deformities, like ankylosis of the hip, which would seem to pretty well settle for the surgeon the operation to be selected. A bad case of ankylosis makes a perineal operation a difficult one, and if it were not a suitable case for litholapaxy, it would be thrown into the class of suprapubic operations.

In cases of foreign bodies existing as nuclei of stones, not known in advance, but only discovered after litholapaxy has begun, the perineal operation has usually been a most satisfactory one, in his experience, and one which he thought should be recommended.

In stricture of the urethra, if it is possible for a guide of any size to be inserted into the bladder, the perineal operation gives opportunity for relief of the stricture. In case of false passages with stone, it would seem that the perineal operation again would be selected for the same reasons, and the case of a stone impacted in the vesical neck so that it could not be pushed back into the bladder and made the subject of litholapaxy, a median perineal operation would seem the most direct method.

As to the mortality, in anticipation of this discussion, he had looked up the latest figures he could find from a number of the journals of the last year or two, and from some of the more recent text-books, and added them together, making a number running up into the thousands. He found that the perineal operation in children had a mortality of 3 per cent., and the suprapubic 12 per cent. So there can be no question which operation should be

performed in children. In adults the perineal operation has a mortality of from 8 per cent. to 12 per cent., and the suprapubic 12 per cent., which would throw a choice somewhat in favor of the perineal method, although not so strongly as in children. In old men the perineal operation has a mortality of from 38 per cent. to 40 per cent., while the suprapubic has only 25 per cent. to 30 per cent. So that in old men the perineal operation seems suddenly to be the more dangerous of the two, if these figures can be relied upon. He wished to say once more, because he had omitted much mention of litholapaxy, that he was only speaking of cases in which a cutting operation was required for some reason, that, in his opinion, litholapaxy is the operation of choice in all cases wherever it can be performed.

As to prostatic cases for simple drainage after catheterism has failed, and when no radical operation is thought of, the perineal operation is to be preferred, on account of the chance of cure, which has already been alluded to, and on account of its simplicity of performance; but if any radical operation is contemplated, the removal of any portion of the prostate, there is no question as to the relative advantages of the two operations. Even if prostatectomy is to be done through the perineum, the advantages of preceding it by a suprapubic incision, enabling the prostate to be pushed well down into the perineum, are so great that he thought suprapubic cystotomy should be made, in the vast majority of cases, an essential part of the operative procedure.

As to tumors, except for the distinctly pedunculated tumors, shown to be such by the cystoscope, the suprapubic operation seems to have obvious advantages. Tumors of various sizes and shapes can be recognized and removed. Bleeding, to which Dr. Dandridge had alluded, may be generally controlled with the patient in the Trendelenburg posture, and by careful packing, so that a sessile tumor may be entirely isolated with a little patience and the operator enabled to see what he is doing; then the peritoneum may be opened and a portion of the wall of the bladder inverted and then sutured externally, the peritoneum closed, and the portion of bladder wall containing the tumor incised; all sorts of manipulations may be employed which are quite impossible through the deep perineal wound, working by the touch and in the dark. Except for pedunculated tumors, the suprapubic operation should therefore be selected, and yet his most satisfactory

cases of bladder tumors had been perineal operations, and in his own experience the mortality has been less, and he had had the best results in those cases in which he had been enabled to remove the tumor through the perineal incision. The theoretical arguments are against the selection of that route, but he did not feel that he should be quite honest if he did not say that his own experience seemed to run counter to the rules dictated by theory.

As to the relative dangers of the two operations: In the suprapubic operation, so far as danger to life is concerned, the chief cause would be infiltration in the prevesical cellular tissue. This can nowadays be avoided; it is not often seen, and if there is great risk of it, as when there is a very septic cystitis, Senn's operation of suprapubic cystotomy in two stages may be adopted with increased safety. The reopening of the wound he had not seen after suprapubic cystotomy. He had seen the perineal wound open, so that he could not think that to be a strong argument against suprapubic operations. The tendency of hernia was not very marked in the ordinary cases of suprapubic cystotomy. On the other hand, perineal cystotomies, if lateral, seem to have definite disadvantages. Impotence has followed, and in a case reported by Dr. Cabot there was a reversed seminal current, the semen, upon ejaculation, passing into the bladder rather than by the normal route; stricture has followed. Occasionally one has quite as great a degree of incontinence of urine as that which follows the suprapubic operation, and a fistula in the perineum is not much to be preferred to a fistula above the pubes. The argument as to the direction which "nature" intended the urine to take, whether below or above the pubes, has not much weight in his mind.

Dr. Edward L. Keyes said that he would allow himself to touch upon two points that had been brought up,—namely, statistics in India and the far East, and the recently revived Bottini operation. Of the first he believed that results in India and the East, and in Egypt (where they seem equally good), should not necessarily influence us greatly in deciding what we shall do here. These Eastern people do not seem to die when they are operated upon. Whether they are spared because they do not use alcohol or for some other reason he did not know; but he did know that statistics in those countries are exceptionally good in the hands, seemingly, of all operators. A gentleman who spoke from personal knowledge told him once that there was a certain mission-

ary in (he thought it was) Arabia whom he had known for many years to dispense his services among the natives to their bodies as well as to their souls. He was exceedingly successful in cutting for stone. Finally he died, and his widow, looking about for means of support and finding none, concluded that she would continue his business as a lithotomist, although her only knowledge of the operation consisted in what she had seen her husband do. She therefore got the instruments together and went ahead, cutting for stone. She had plenty of patients and a success equal to that which her husband had obtained.

Now about the electrocautery as applied to the prostatic bar; the worst thing that can be said about it is that Bottini devised and practised and wrote about the method for very many years, and never gained any general following until quite recently in Germany and in New York, in both of which places a special advocate has sprung up, due, he believed, to the fact that the pendulum of general prostatectomy had swung too far, and that efforts to find simpler means of relief were being attempted in all directions.

The matter is not yet judged, and we are not justified in drawing conclusions about it until it has been more widely tested. All that we know is that multiple operations are required, and that the mortality is high,—although, of course, some of the deaths are explained away. Moreover, the operation does not belong clearly to general surgery, but requires special training and technical skill. More operations must be done before we can generalize about it. He considered it still in the balance. It cannot be discussed until many more individuals have performed it, giving points of view from different directions.

Dr. White had mentioned the permanent catheter tied in. This method of drainage is worthy of more consideration. He had a patient long ago who wore a Holt's catheter tied in for about four years, night and day. He kept a cork in it, which he withdrew at stated intervals, and walked about at his business with great comfort, until multiple stone formed from lack of efficient washing. He cut him and removed the stones and a portion of his prostate, enabling him to dispense with his catheter and urinate at will.

He had employed this method of drainage in many cases, and considered it a means not to be lost sight of.

The methods of permanent drainage, both suprapubic and

perineal, he had been in constant contact with for more than thirty years, since his student life. One of his earliest memories is that of an old gentleman who,—he thought it was in the year 1867,—having a prostatic obstruction through which his honored master, Dr. Van Buren, could not pass a catheter, was cut over the pubes for drainage, and wore for nearly a year, until he died, a long double silver tube, made exactly after the plan of the ordinary tracheotomy-tube, and it served its purpose admirably.

One of his own very early operations for permanent drainage was for a case of cancer involving the prostate and floor of the bladder. This patient did very well for a considerable period, wearing a long, silver, flattened perineal tube tied in, but he did not get about very much. And from these cases onward he had seen a variety of hard and soft rubber devices applied for the purpose of continued drainage and worn sometimes through the perineum, sometimes above the bone, with more or less comfort and discomfort, according to the case; but worn, and worn for a long time with safety.

Drainage, of course, is done for the purpose of relieving the necessity of the bladder for a considerable time or permanently, when the natural right of way cannot be re-established, and for the cure of chronic (often putrid) cystitis.

For the latter his preference was always the perineal route; for the former, notably in cases of cancer and tubercle, the suprapubic. Prostatic cases require individual study in electing a route, but, he thought, most of them, when such an unusual means was called for, would in election fall under the suprapubic route, unless the drainage be used as a method for the cure of putrid cystitis; and then he agreed with Dr. Dandridge that the perineum was usually the better direction in which to drain.

As for the actual danger to life, as a consideration, his belief is that the perineal route possesses the less danger. As for ease of execution, both are so simple that there is little choice.

He differed from Dr. White as to the usual cause of death after suprapubic cystotomy. He did not fear hæmorrhage, or sepsis, or infiltration, or suppuration in the prevesical spaces. All of these things may occur, but they can be headed off. The danger after suprapubic cystotomy, and the only dread he had, was urinary suppression. He considered it the most constant cause of death. Of course, patients do die also even with polyuria, with

high temperature, uræmic; and they die in other ways; but he looked upon suppression as the most deadly complication.

And, furthermore, he considered a patient with urinary cachexia, septic, with pyelitis, putrid urine, chronic cystitis, feeble digestion, and apparently no nerve-force left, a better subject for operation, either suprapubic or perineal, than he did the other type of patient, nervous, neuralgic, with hard arteries, abundant, pale, thin urine, of low specific gravity, containing little or no pus, especially if he have also nocturnal polyuria. This latter patient is very likely, after operation, either to go on with increased polyuria and perhaps wandering in his mind, to die uræmic, with a high temperature, or to suffer prompt suppression which does not yield to treatment.

He wished to make another statement also in favor of the use of laughing gas, or of chloroform instead of ether for any operation upon the bladder of an old man, especially if that operation is to be a long one. With laughing gas one may operate for an hour or more, and the patient comes out smiling, without nausea, shock, or depression. Suppression is often due to the effort made by a damaged kidney to eliminate a large quantity of ether from the blood, and the septic pneumonia coming on in the second week after operation is often started by the traumatic irritation of the lungs caused by breathing the dense fumes of ether for a long time.

In many cases of inoperable cancer, involving the prostate and floor of the bladder, he had seen patients made quite comfortable for many months by a suitable permanent suprapubic tube; but he wished to say here that cutting the bladder open and thus relieving tension does not always, as Guyon asserts, relieve tenesmus. He had seen the latter occasionally persist, notably in tubercular cystitis, even when the bladder was kept empty by a permanent suprapubic tube. He remembered one rather curious case, of an old man with cancer, who wore a permanent suprapubic tube for the better part of a year before his death. He enjoyed great comfort, and never had the feeling of vesical repletion or of a desire to urinate excepting when he went to stool; but when he, by voluntary effort, extruded the contents of the rectum at stool, he felt a painful desire to urinate, with a little tenesmus, although the bladder was empty, the tube being in place.

Now as to stone. Any one who is reasonably versed in litholapaxy by having operated a number of times must be convinced of its general applicability for children, adults, and old people, in a great majority of instances. But he believed that it was generally conceded that when, for any reason, a stone should not be crushed, the suprapubic operation was called for, and notably under these four circumstances:

(1) When the stone is excessively large.
(2) When it is encysted.
(3) When it is complicated by tumor.
(4) When it has formed upon a foreign body.

Of course, when the contraindication to litholapaxy is urethral obstruction, then the perineal route is called for, because that operation deals not only with the stone but often with its cause (stricture). He wished, however, to make the point that there are a certain number of quite small stones in prostatic subjects which in very skilful hands might be mastered by litholapaxy, but which, none the less, will do better if treated by cystotomy suprapubically. He referred to cases of small, flat stone, difficult to pick up from the post-prostatic pouch, notably in cases where the prostate is long and has an irritable granular bar. In such cases the irritation of this bar, produced by the manipulation with large instruments, often causes so much cystitis that, although the stone be wholly removed, the patient is worse off after the operation than before, and the effort at his relief may give him a cystitis of longer duration and of greater discomfort than would have been given by a well-performed prostatectomy. In these cases he had been often willing to make the patient's necessity the surgeon's opportunity, and to cut where he might equally well have crushed, believing it to be to the patient's advantage to do so.

For prostatic hypertrophy prostatectomy, it seemed to him, especially total prostatectomy, had been overdone. In this country he believed, and he was sure in France, there is to-day a tendency to do less of it, and to return oftener to the more conservative use of the catheter, with vesical lavage. But still prostatectomies have to be done, and the question is the election of a method. Upon this point it is very difficult to generalize.

His experience in the matter led him to believe that partial prostatectomy, if the urethral outlet be lowered at the same time,

will give as good a result in many instances as total prostatectomy, and with less risk to life. Very soft prostates lend themselves readily to enucleation and may be properly shelled out whole. Interstitial fibromyomata, of course, should be taken out; but in many, very many, cases of prostatic overgrowth, particularly the very hard variety, if the fringes and pedunculated outgrowths, and horse-collar projections, and third lobes, and, notably, the bar, be thoroughly removed and the internal urethral orifice cut away with an emporté pièce well into the prostatic sinus; if all this be done, the functional condition of the patient is rendered as good as after total prostatectomy; the operation is shorter, hæmorrhage less, danger to life less, and all these things can sometimes be done safely and effectively through the perineal route, when the prostate is not peripherally very large, so that the finger, passed through the wound, can easily pass beyond the vesical orifice and explore thoroughly. In such cases, then, he preferred the perineal route for the performance of partial prostatectomy. The results are excellent, and danger to life relatively small. When, however, the prostate is very large, it cannot be properly attacked through the perineum, and the suprapubic route must be elected, even if the prostatectomy is to be partial.

Finally, as to a choice of route in the case of tumor or cancer there can be no question. The high route, allowing the faithful eye to aid the possibly faulty finger, must be elected.

DR. ARTHUR T. CABOT confined himself to a simple statement of his personal experience in the methods of cystotomy.

In regard to the choice of incision for bladder drainage, he did not recall any cases in which he had made incision into the bladder in the past ten years for bladder drainage alone. He had operated a number of times where drainage had been a very essential part of the operation, but in which the operation had also the very important function of correcting some condition which was responsible for the persistence of the cystitis, such as obstruction in the prostate, in the urethra, or some tumor or calculus in the bladder. He thought the reason that he had not opened the bladder for drainage had been that he had had such good success in the method of drainage through an inlying catheter. He had used this form of drainage a great many times, even on patients who were desperately sick, too sick, it seemed, to bear a cutting operation, but who had improved immediately

when adequate drainage through a catheter was supplied. Some of these patients, in whom the urine had been almost suppressed, and who already showed evidences of incipient uræmia, had quickly recovered after the catheter was placed in position. He had even used catheter drainage in cases of quite profuse hæmorrhage into the bladder. In such cases it is possible, by patience, to suck the blood out by attaching a stiff rubber tube to the end of the catheter and, as it were, milking it,—that is, stripping it and allowing it to expand, and thus drawing the clots forward out of the bladder. In a number of cases in which he had used this method the hæmorrhage had ceased when the bladder was emptied. In the few cases in which the hæmorrhage had persisted he had opened the bladder, and always by the suprapubic route, which he selected, feeling that it was important to discover and remove the cause of the hæmorrhage, and to afford opportunity, when it was troublesome, to pack the bladder with gauze.

In regard to the operation for stone, he believed, as had been already said, that litholopaxy was the operation of choice. He had never yet met a stone so hard that it could not be crushed, and yet small enough to be properly approached by the perineal route, so that in cases in which he had failed in crushing he had always used the suprapubic incision.

As to the statistics of crushing, he did not think the results reported from India need any special explanation, for a recent examination of his own results showed that in 116 cases there were four deaths, and of these, two patients died of pneumonia, consequent upon a chronic bronchitis, which existed before the operation. The average age of the patients was a little above sixty years. He could make no comparison of the two operations under his own hand, for he had used suprapubic lithotomy only in difficult cases, where he could not crush. In children he thought that lateral lithotomy was very much safer than the suprapubic operation. No doubt most children can be treated by litholapaxy, especially if, in the cases where the anterior urethra is narrow, one opens the perineum and makes the operation a perineal lithotomy. It is quite extraordinary how greatly the perineal incision adds to the ease of the operation. The deep urethra is so distensible that it easily admits instruments that were much impeded, both in their introduction and their after manipulation, through the penile urethra.

He thought there was comparative unanimity of opinion that the high operation was the proper one for dealing with bladder tumors. Dr. White had said that he had had better results in the few cases that he had done by the perineal route. Possibly that was because they were instances of simple pedunculated growths. Even in these cases, the suprapubic opening affords better opportunity for thorough removal.

In the operative treatment of prostatic hypertrophy he had had but little experience in the use of the perineal incision. He had operated by the perineal route and followed the method proposed by Dr. Harrison, in some of his early cases, with fairly good success. He had only employed the suprapubic route of late years, because it gives a better opportunity for appreciating and correcting the conditions causing the obstruction. The perineal incision has, however, one advantage, especially when the obstruction is a bar across the neck of the bladder; and this is that the tube introduced through the prostatic urethra for drainage keeps the wounded surfaces apart during healing, and thus moulds and tends to keep open the newly formed outlet of the bladder. It would seem well to introduce perineal drainage after a suprapubic prostatectomy when the conditions seem to make this moulding of the urethral orifice important. For simple purpose of drainage after prostatectomy he had not for many years used a perineal tube, for he had always found suprapubic drainage with two tubes thoroughly satisfactory.

As to one or two other incidental points, aside from the direct line of discussion, of interest. Dr. White had pointed out the real use of the colpeurynter; that it raises the base of the bladder and brings it near the suprapubic opening, and for that purpose Dr. Cabot had used it. He operated in the Trendelenburg position, and as the object of that position is to induce the bladder, by its weight, to fall towards the umbilicus and so to increase the distance between the fold of peritoneum and the pubes, it seems more reasonable to fill it with a heavy fluid, which will add to its weight, rather than with air.

Dr. L. S. Pilcher said that it might not be amiss to remember that the suprapubic route for reaching the bladder had been appreciated as generally practicable only during the past few years, although the history of surgery shows that the sixteenth century should be credited with its introduction. It is true that

since that time it has been suggested from time to time, but only to be laid aside, so that all certainly know, when it is said that fifteen years ago it was unused and had no standing as a surgical procedure, that the statement is correct. That being the case, the mental preoccupation of those surgeons whose experience dates back beyond that period has been with methods other than the suprapubic. It is only since the suprapubic operation has been demonstrated to be a practical thing that bladder surgery has made any very great advancement over that which it had attained in the practice of our fathers. In these more modern indications for attack on the bladder, it has been stated by those who have already spoken that the suprapubic route, as a rule, is the one to be adopted, but in the one class of bladder operations in which our fathers excelled us,—viz., that for the removal of stone,—one still finds a frequently expressed opinion that procedures which can be used through the urethra and perineum are still the procedures of choice. The previous speakers had each repeated that the method of choice for attacking stone in the bladder is that of litholapaxy. But since, in the work of the speaker during the past twelve years, litholapaxy has not been the method of almost universal choice, he ventured to strike a discordant note by trying to give some reason why it had seemed to him in his own work to be a more proper thing, as a rule, to reach a stone in the bladder by a cutting operation through an incision above the pubis than to trust to the attempt to remove the stone by crushing and suction and washing.

He had no statistics to present. He doubted very much whether these matters were to be settled by statistics. Any surgical method of procedure can be tested by general principles rather than by statistics.

He asked first, whether the reaching of a stone in the bladder and its crushing by an instrument and its after-evacuation by a process of suction and washing is a more simple operation than the operation of making a simple incision into the bladder and its removal by a forceps. Does it make any less traumatism? Does it take any less time? Does it involve any less shock? Is it a less serious operation as a whole?

It had seemed to him that, as a rule, the suprapubic incision could be done, and is being done to-day, in a manner that constitutes it a more rapid, a more simple, a less severe operation, and

one which is attended with greater likelihood of permanent cure than the procedure which is understood by the term of *litholapaxy*. He spoke from the stand-point of a general surgeon, not from that of one who has devoted himself to dealing with this class of cases specially, who, by reason of his special aptitude or special experience has been able to obtain a special skill in the performance of a peculiar technical procedure, but rather from the standpoint of the general surgeon who occasionally has to do with this condition,—what should be the operation of choice for this numerous class of surgeons, that they should seek to empty a bladder of stone by litholapaxy or by the perfected suprapubic incision.

He was inclined to believe, from the observation of the results of the work of others and from the limited experience which he had had himself, that in the hands of the average surgeon the operation of litholapaxy is by no means a generally safe and desirable operation; that it is in many cases an incomplete operation; that it is in many cases a severe and fatal operation; that it is a more difficult operation to perform than is the operation which may be done of opening the bladder above the pubes or even through the perineum. For these reasons he found that for the last ten years the apparatus for crushing the stone in the bladder in his own work has been more and more left upon the shelf, and that more and more the attempt to remove the stone as a matter of routine by the incision had been adopted. Any bladder into which a catheter can be introduced, however small, —and the softer and less irritating it is the better,—and which can be at all dilated, when it is possible to have access to the inflating bulbs of the ordinary syringe, and still better, if one has an inflating bulb of a cautery apparatus, any such bladder may be readily and in a moment inflated and made to protrude above the pubes so as to be readily accessible; no special apparatus is needed; the knife, forceps, and the simplest retractors are all that are required. When the bladder is opened, the possibility of its full exploration is secured, the emptying of the bladder is a matter of but a short time, while the least possible traumatism is inflicted upon it. When one compares the relative amount of traumatism of the suprapubic with that of the perineal operation, it seemed to him that even in the simplest perineal operation (and in the hands of a skilled operator it is ordinarily a simple operation) the

amount of traumatism is less in the suprapubic operation, and certainly the interference between the vascular and nervous relations is much less in the suprapubic than in the perineal; the reflex, distant, late contingencies are likely to be much less in the suprapubic than in the perineal operation, wherefore it was that in his own work he had adopted the suprapubic operation as the method of choice even in dealing with ordinary cases of stone in the bladder.

TRANSACTIONS OF THE PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, May 1, 1899.

The President, J. EWING MEARS, M.D., in the Chair.

ACUTE CHOLECYSTITIS; CŒLIOTOMY.

DR. ALFRED C. WOOD remarked that acute inflammation of the gall-bladder, as a complication or sequel of the infectious diseases, has been recognized for a long time. There is, however, another class of cases to which his attention had been called but recently, in which the disease develops suddenly, in a person in good health, and in many instances in whom there has been no previous symptom referable to the biliary system. It is to this class that the case reported belongs.

Miss E. R., single, aged twenty-seven years. For a year prior to the present illness there had been some pain, at times, in the right iliac fossa, which was thought to be ovarian in origin, and to be the result of using a sewing-machine a great deal.

On August 31, last, she left home in her usual health to visit friends; during the night she was awakened with a chill, which she said was a very hard one, and lasted for a considerable time. After the chill had passed she fell asleep, and woke later with a high fever and severe pain in the head and back. A physician was summoned, who administered an hypodermic injection of morphine for the severe pain in the back. During the day (September 1) nausea and vomiting supervened. The matter vomited was principally bile. Severe general abdominal pain was next noted. There was no bowel disturbance. During the following ten days the same conditions prevailed, sometimes better and other times worse. The temperature ranged between 102° and 105° F.; the pulse at times being as high as 150. The abdomen was very tender to the touch, and gradually became more and

more distended until, on the tenth day, it was said to have been extreme. During this time the treatment had consisted in the administration of morphine to relieve the pain, and calomel, when necessary, to secure an action of the bowels. The diet had been limited to liquids, and turpentine and hot fomentations were applied to relieve the abdominal pain and distention.

She was first seen by Dr. Wood on the eleventh day of her illness. At the time of his examination the patient's expression was that of a person extremely ill, being that commonly observed in cases of peritonitis. The temperature was $103^{3}/_{5}°$ F., the pulse 130, and the respiration 34. The abdomen was uniformly distended and everywhere exquisitely tender to the touch. In fact, the jarring of the bed, caused by a person walking across the room, gave rise to acute pain. The patient lay on her back with the knees drawn up; the abdomen was everywhere tympanitic. Palpation yielded no information, save that the tenderness seemed slightly more acute at some points than at others. This sign was of no value, however, inasmuch as the points of greatest tenderness changed at successive examinations. It was never sufficiently constant at McBurney's point or over the gall-bladder to point conclusively to either of these regions as the origin of the trouble; in fact, the left iliac region, the right lumbar region, and the left hypochondriac regions were successively found to be the most sensitive points to pressure.

Being unable to decide whether the patient's condition had its origin in the appendix or in the gall-bladder, he advised an abdominal section, intending to first explore the right iliac fossa, and if this were found normal to examine the gall-bladder. The patient was, however, in a remote district of the country, where the necessary appliances for carrying out a modern operation were not obtainable, and where it would have been impossible to have given her the proper attention after operation. She was therefore removed to the University Hospital, in this city, a distance of 500 miles, where the case was further studied. During the two days that elapsed between her arrival at the hospital and the time for operation, the symptoms seemed to point more and more towards appendicitis. There seemed to be slightly more resistance in the right iliac region than elsewhere over the abdomen, and that there was a gradually developing dulness.

When the common incision for reaching the appendix was

made, the contents of the right iliac fossa were found to be absolutely normal, but on passing his hand up towards the gall-bladder a large mass was discovered which led him to prolong his incision upward to that point, where he found the viscera adherent to each other and to the anterior abdominal wall. On separating the adhesions a considerable quantity of purulent bile was evacuated. The patient's condition was such that he was then obliged to provide for drainage, to pack off the general peritoneal cavity with gauze, and to close the wound as rapidly as possible.

The convalescence was slow but uninterrupted. The temperature reached the normal point on the sixth day. Bile flowed freely from the opening for several weeks, but the sinus finally closed and remains healed at the time of this writing (June, 1899).

He reported this case thus fully because he believed, with Dr. Maurice H. Richardson, who, in his excellent article in the *American Journal of the Medical Sciences*, Vol. cxv, 1898, p. 629, states that "this subject seems worthy of discussion in connection with that of acute abdominal lesions demanding immediate interference; for acute cholecystis,—acute accidental cholecystitis, if I may thus designate this lesion,—though comparatively rare, is more frequent than such well-recognized lesions as intussusception, volvulus, or other forms of acute intestinal obstructions."

Acute phlegmonous inflammation of the gall-bladder is eminently a surgical affection and demands early operative intervention. Although healthy bile is said to be sterile, and to be tolerated by the peritoneum, the condition is quite different when the gall-bladder is the seat of an infectious inflammation. In the class of cases to which the one just reported belongs, it would seem, in the present state of our knowledge, that the diagnosis must not infrequently be made at the time of operation. In the case described there had been no illness for nine years; there had never been a single symptom of the presence of gall-stones. He did not know whether in the beginning of the attack careful palpation would have revealed the presence of a distended gall-bladder or not, but by the eleventh day the abdominal distention was so great that it was impossible to determine this point. There are cases in which the localization of the pain and the distention of the gall-bladder will lead to an immediate recognition of the trouble, but there are others in which, as in this one, it is abso-

lutely impossible to distinguish it from appendicitis or a local peritonitis due to rupture of an intestinal or a gastric ulcer or other similar cause.

The operative treatment of acute cholecystitis should be as successful as that of appendicitis, if an early diagnosis be made. The technique need not be described, as this is familiar to every surgeon.

Dr. Richardson reports (*loc. cit.*) ten cases of acute cholecystitis without known pre-existing disease, in a total of fifty-nine operations upon the gall-bladder, a most interesting series and well worthy of careful study. In some of these the histories are very similar to the one detailed, although the temperature in the latter was rather higher than in the series referred to.

THE CHOICE OF OPERATIONS UPON THE MALE BLADDER.

DR. JOHN H. BRINTON said that when this subject was brought before the academy on a recent occasion (ANNALS OF SURGERY, July, 1899, p. 103), it seemed to him that book directions were too closely adhered to; that there was a somewhat vague impression of individual opinion, and that sufficient prominence was hardly given to every-day, real practice.

The procedures or operations on the male bladder, to which he particularly referred, were, first, litholapaxy; secondly, the different methods of perineal lithotomy; and, lastly, the suprapubic or high operation of cystotomy. First, however, he recalled, for a moment, the old method of lithotrity, now practically obsolete. It had, he thought, its advantages, at all events for a time, and it had great disadvantages. In the early days the stone was usually crushed with the fenestrated instrument. This, from its then faulty construction, sometimes nipped the vesical walls; indeed, he had seen a strip of mucous membrane come away hanging from between the blades. Then, too, the fragments were simply broken, of rather large size, and often angular; although finer and better work was later done by the use of the duck-bill lithotrite.

A complication attending the use of all of these instruments was the liability of the blades to become clogged with imperfectly crushed fragments. When this occurred, the withdrawal of

the instrument was sometimes difficult; and he had known serious injury to be inflicted on the walls of the deep urethra.

He remembered operating on a case in a large hospital in this city, a great many years ago, using a crusher, which at that time was considered a very satisfactory instrument. It did its work apparently well, and yet, when he came to withdraw it, he found great difficulty in bringing it through the urethra. It had clogged, allowing a large piece of stone to become thoroughly and firmly impacted. He worked very carefully for a long time, —the patient was an old man,—and succeeded, finally, in extracting the instrument. At the same time, so much injury was done to the urethra that, from shock of the operation and injury to the walls of the urethra, death took place after several days, and on post-mortem examination, the walls of the urethra were found to be severely bruised and were on the point of sloughing.

Then, he knew of another case, in the practice of a prominent surgeon, in which the urethra was absolutely torn off, the result of a clogged lithotrite, and that patient died.

In connection with lithotrity, he recalled to memory the operation of a great surgeon, one who was in fact a surgeon to the very ends of his fingers, the late Professor Joseph Pancoast. Any one who had seen him operate would recall the wonderful facility and certainty with which he would find and catch the stone, and the skill with which he would crush it into fine pieces. He never would explain exactly how he found the stone. His directions were simply these: "You put the instrument into the bladder, turn it around, and pick up the stone." That was all; and in this respect he spoke much as Civiale did. Dr. Brinton had often closely watched Dr. Pancoast in this operation, and he was quite sure that he always followed a carefully considered plan of procedure to detect and grasp the stone. His technique, to use our modern term, was always the same: it was one from which he never deviated. Dr. Pancoast, having introduced his instrument into the partially dilated bladder, would push it right back until it reached the posterior wall of the bladder, then, turning the instrument eight or ninety degrees, he would gently draw it forward along the left side of the vesical walls, until the hooked blade would be arrested by the posterior portion of the prostate. He then depressed the handle between the thighs of the patient, so that the elevated curved beak could sweep closely and accu-

rately behind the prostate, and this manœuvre he would repeat to insure an exhaustive search of the vesical neck and post-prostatic region. This done the instrument was pushed backward, along the right side, to the posterior wall of the bladder, drawn forward, and the right side searched in like manner. Then with beak upturned, the anterior wall was swept, to discover any possible encysted calculus. When any calculus was detected loose in the bladder, he would with the curve of the instrument make slight pressure, so as to form a sort of cup in the mucous membrane, and then gently separating the blades, tapping them with some small metallic object, would receive the calculus, between the open blades slightly rotated to receive it. This was his manipulation for the detection and grasping of the stone; simple enough in practice, but almost magical to the eyes of a by-stander. The rest, to use Dr. Pancoast's words, the getting rid of the stone, was best accomplished by crushing it moderately fine, and letting the patient "piddle it out." This operation of lithotrity, a good one in its time, has, however, passed away, and is now superseded by litholapaxy. The latter has its advantages,—advantages in rapidity,—in the fact that the operation is done at a single sitting, and that, when done well, it is a very thorough operation. Now as to litholapaxy.

What are the difficulties of this procedure, and has it any dangers? The difficulties of too small a urethra, or contracted meatus, may usually be easily overcome. With a delicate hand and gentle touch, manipulation may possibly be carried on despite an enlarged and tender prostate. There is no great difficulty in catching a stone, and in properly breaking it. The fenestrated lithotrite has given way to safer treatments, and we have the powerful and lipped crushers of Bigelow; the varieties of Thompson's instrument, and the powerful one of Forbes, possibly the best yet devised.

The crusher which he preferred is a Thompson instrument, changed and modified. It has the exact curve of Bigelow's instrument, with a shorter female blade, and a strong, indented male blade, with teeth sloping outward. These blades are so fashioned that impaction under any circumstances is impossible, and the instrument can always be readily inserted and withdrawn. Its size is No. 27 of the French scale.

As to the dangers of litholapaxy, for dangers there are, and

patients do die often after this operation. Every surgeon of to-day, who has had much to do with crushing stone, has seen or known of death following litholapaxy. Professor Bigelow, in his early paper, in 1878, gives one death occurring in seven cases, and remarks, " It must pass for what it is worth." Immediately after the announcement of the method of litholapaxy the speaker was greatly attracted by the description given, and he determined to make trial of the operation. He did so, and in two days lost his patient, the only one he had ever lost after this procedure. This set him to thinking, and he tried experimentally to determine in what the danger lay. He took bladders, human and from the pig,, placed them on the table, and injected into them varying measured amounts of water, having first inserted fragments of crushed calculi. He then made use of Bigelow's evacuating bag and tube, carefully noting the degree of digital pressure on the bag, just sufficient to agitate the fragments, the amount of water thrown in, and the distending effect upon the bladder. With a stiff rubber bulb, the amount thrown in by moderate pressure was about one and a half to two ounces; with a softer and more easily compressed rubber, from two to three ounces. The distending effects upon a bladder already nearly filled was very great, and he could understand how in a living bladder, especially if diseased, unlooked-for injury might be produced.

From experiments made upon bladders of varying capacity he was convinced that, unless the surgeon is practised and careful, he may by too rapid and over-distention unwittingly inflict damage upon a bladder to a disastrous and even fatal extent. To avoid such results he had, to his own mind, laid down the rules to be rigidly observed in the performance of the operation of litholapaxy.

(1) Draw off all accumulated urine, and carefully determine the full painless capacity of the bladder, two or three days before operation.

(2) In like manner determine the capacity of the bladder when patient is etherized for operation.

(3) Before using the evacuating instrument throw into the bladder borated or other proper antisepsic solution, to the extent of not more than three-fourths its capacity under ether. Thus, if the bladder will easily hold eight ounces, inject not more than six ounces.

(4) Use only moderate efforts with the evacuating instrument, making short, quick, squeezing pressure-movements with the fingers.

This matter of the over-distention of the bladder he believed to be one of the greatest dangers of litholapaxy. It can, however, be avoided, if the operator will only bear in mind the natural capacity of the bladder, and at all stages of his procedure refrain from throwing into the organ more than it can bear without undue strain. He should always keep one-fourth at least of the bladder empty. Clinically he had observed that a disregard of these precautions had been followed by disastrous results; and this is only what one might expect, when it is remembered that, in this operation, one has often to proceed in the face of, possibly, associate affections of the prostate, ureters, and kidney.

There is one clinical symptom which has not attracted attention,—viz., the groaning of the patient under ether, coincident with distention of the bladder. He thought that this is produced by over-distention, most apt to occur at the beginning of the evacuation, before leakage by the urethra to any extent has occurred, or just after the bladder has been refilled. He looked upon this groaning under ether, the result of pressure from the evacuating bulb, as a prophetic symptom of the gravest nature.

From what he had said it would be inferred that he regarded the operation of litholapaxy as a dangerous one in the hands of the general surgeon, and so he did. He looked upon it as very dangerous, save at the hands of a skilled few. He was sure that he was not alone in this view.

Passing now to the suprapubic operation,—is there not much to be said in its favor? It can be done with the greatest ease, and when the bladder is opened, a thorough examination of that organ can be made. Any calculus present can be detected absolutely and at once, whether loose, or encysted, or hidden behind a projecting lip of the prostate. Not only can the finger be used in the examination, but by the employment of proper electric illumination the interior of the bladder may be thoroughly inspected. Any foreign substance can be detected and removed, and, if the operator so wishes, protruding portions of the prostate may readily be taken away. The entire cavity of the bladder is under view; any necessary operative manipulation can be rapidly and efficiently performed; and when finished, the

surgeon has that comfortable certainty of mind that he has seen everything inside the bladder; that nothing has been concealed or omitted; and that he has done for his patient all that he believed to be right. This certainly is a great matter in exact procedures, and cannot be arrived at by any other process than suprapubic cystotomy. The radical treatment of stone and its complications is thus made easy.

As for the dangers of the suprapubic operation, done in accordance with modern precautions, and with a full antiseptic technique, they are not great. The speaker had done a good many high operations for stone and for drainage, and had been so fortunate as never to lose a case. He had seen a great many more suprapubic cuts done by his friends, and had heard of but two deaths. It is sometimes said that this operation is a dangerous one. He thought, however, this statement to be based upon inherited opinions and prejudices. It usually was not the case in his personal experience and observations.

Drainage.—Many cases occur in which it is advisable to preserve a permanent drainage from the bladder. This may be demanded, *inter alia,* for chronic diseases of the mucous membrane, or for obstructive enlargement of the prostate gland. The problem of the preservation of a permanent fistula, practically the formation of a new urethra by the method of Dr. Hunter Maguire of Virginia, had greatly interested him. He had in many instances resorted to this drainage through a suprapubic fistula, which had in time become a satisfactory permanent new urethra. This he had successfully brought about by the daily insertion of short, flexible, block-tin, female catheters, of sizes proportioned to the calibre of the fistula, and bent or curved according to its direction. These he left in for a few hours, for a day or two at a time, until the new channel becomes callous, and accustomed to the passage of urine. Then a silver tube, of the size and curve arrived at, may be substituted and worn if necessary, closed with some sort of obturator, which can be loosed and withdrawn when necessary. In this manner leakage of urine in many cases may be practically overcome. Left to itself, the urine in the bladder accumulates, until the level of the artificial vesical opening is reached. Then escape of urine (leakage) will happen. Very often, however, the patient will first experience some strange, undefined desire to get rid of the contents of the bladder, which

may be accomplished by the insertion of a short catheter, or by opening the vent of the one already worn in position.

By these means, the patient can obtain a fairly good urethra, and in cases of prostatic hypertrophy, one is able to discard, as it were, the enlarged prostate, leaving the patient to draw off his own urine through this short, artificial urethra, comfortably and at his pleasure.

He had a patient, seventy-eight years of age, on whom he established, five or six years ago, an artificial urethra, after removing two stones by the suprapubic method. He has since passed all his water through the artificial canal, none by the natural urethra. He does not wear any permanent tube, but draws off his water as required; when he goes to bed at night, in the morning, again about his time of luncheon, and when he goes home for late dinner. He wears a small pad for safety's sake, but there is no leakage.

Dr. Brinton performed, years ago, a like operation, with equally good results, on a man fifty odd years of age, who still farms himself a tract of land of 160 rather barren acres, near the North Carolina coast. He has never, since the operation, passed a drop of water through the natural channel, and has not been troubled, in any way, with his enlarged prostate.

He had sometimes asked himself, What would I have done, if I were so unfortunate as to have, beyond peradventure, a calculus in my bladder? His answer to such a self-directed question would be briefly this, If the stone were a small one, and a soft one, he would have it thoroughly crushed, and try and pass it, *per urethram,* or possibly, if he could command the services of a skilful surgeon, whom he could trust, he would, perhaps, have it washed out. If, however, he had reason to believe that the stone was large or hard, or both, he would unquestionably have the high operation performed, since by the choice of this operation he firmly believes that less risk of life would be incurred, and that the operation, if successful, would be more apt to be final and happy in its results.

In conclusion, Dr. Brinton inquired whether any member present had ever observed evil consequences follow the X-ray examination of the bladder. He asked this question for this reason: Some time since he was present at such an examination, made on the person of a man suspected of stone, which repeated

previous searchings with the sound had failed to realize. The examiner was an expert, and the exposure about twenty-three minutes, with a negative result. Later the calculus was detected by the sound, and extracted by the suprapubic method. Several days afterwards a slough occurred around the wound, which involved the subcutaneous tissue and skin and travelled down in front of the bladder. The patient recovered, but the complication was an annoying one, although he could not speak positively as to its cause; which may have been some subtle influence of the rays, or slight urinary infiltration, or both causes acting together. He should say, however, that the drainage from the bladder was at all times good.

Dr. W. W. Keen said that he thought the choice of operation depends much on the age and the general health of the patient, as well as the size and character of the stone. If he were to choose between litholapaxy and suprapubic systotomy, and the patient were an old man and in feeble health, he would not do a litholapaxy. As a rule, in these cases the kidneys are not sound, —indeed, they may be very much diseased,—and the prolonged use of any anæsthetic, and the necessary shock that follows it, make suprapubic cystotomy very much preferable to litholapaxy. In a man with a moderate-sized stone, in vigorous health and relatively young, he would choose litholapaxy.

As to the rules laid down by Dr. Brinton with reference to the size and character of the stone, he agreed with him, but the question of age he did not touch upon. He thought his remarks as to the quantity of water with which the bladder should be distended are very much in point, and it would be well for all to heed them. The normal capacity of the bladder, of course, should be ascertained, and before applying suction to the bladder a fixed amount of water should be allowed to escape, in order to avoid the possibility of over-distention or rupture of the bladder.

For distending the bladder, however, he thought air to be much safer, especially in older persons, air being more elastic and less likely to damage the walls of the bladder. He had not found any difficulty in reaching the bladder when it was distended with air. It makes a very firm support. He liked the rectal bag, at least where one has to deal with the posterior wall of the bladder. He had found one advantage, that when an incision was made into the bladder the wound was not flooded with

water, but one can very quickly catch the walls of the bladder, and further manipulations can be carried on as desired. He did not think it necessary to suture the walls of the bladder to the abdominal wound. He had never done so, but had found that the wound is very quickly soldered together, and establishes a thorough protection against sepsis.

The drainage he had usually employed had been that which was devised by Cathcart, and he had found it, not only in the bladder, but in abdominal, thoracic, and other cases, to be very useful. It was more effective in his hands than any other method.

In reference to the question of the X-rays, he thought surgeons should be very careful as to their use, as there had been so many cases of burn reported,—in other words, he was very much inclined not to be willing to use the X-rays, at least in any case where a prolonged exposure was demanded, as in cases where the thickness of the parts is very great, without having a paper signed by the patient himself, assuming all liability if any injury should follow. In the very best hands such accidents have occurred, and there is now pending in this city a suit for such a burn. It is not the surgeon, it is not the X-ray operator who is responsible,—it is one of the things that no one can foresee. If the patient would not be willing to assume the responsibility, he would decline to use the X-ray.

The method which has been adopted recently by Cordier in skiagraphing stone in the bladder deserves mention. By inserting a narrow plate like an ordinary microscopic slide, suitably protected, into the rectum, in a man, or the vagina, in a woman, so that no poisonous effects would be produced, and by placing the tube above the abdomen, he has obtained most satisfactory results. It is not only suitable for cases of stone, but also applicable to foreign bodies in the bladder.

DR. DEAVER said that, in cases of stone in the bladder, he favored litholapaxy with very few exceptions. He had done a number of operations for litholapaxy, and had lost but one patient. That was an old gentleman, about seventy-six years of age. He made an autopsy in the case, and found a hydronephrosis of the right kidney and a contracted left kidney, with a very large cyst involving the ureter. That man would have died, litholapaxy or any other operation.

There are certain cases where litholapaxy is out of the ques-

tion, but in the majority of cases it is the operation. He would not cut for a stone when it could be crushed and he could go to business in a few days thereafter.

Of all operations, in that of litholapaxy the patients should be profoundly anæsthetized, to make the parts amenable to manipulation. It is only necessary to have two or three ounces of water in the bladder. He always went short of distention. With regard to evacuation, he used very little motion,—very little pressure. He was governed by the force necessary to bring the fragments into the bulb of the evacuator.

In regard to the question of death, there is no doubt but that prolonged etherization is a factor, but if one examines the statistics of the two operations the cutting operations are attended by higher mortality than the crushing operation.

Another strong point in favor of the crushing operation is that the patient will agreeably submit to crushing, where he would not submit to cutting, and while there are very few cases of fistulæ following the suprapubic or perineal operations, it does occasionally occur. He had often thought of the remark of Dr. Agnew, that he could not see the philosophy of going to the top of a house and breaking through the roof, while he could enter through the cellar door, and he believed that perineal drainage is best, except in the presence of a very large prostate gland.

INTERSCAPULO-THORACIC AMPUTATION.

Dr. Robert G. Le Conte read a paper with the above title.

INTERSCAPULO-THORACIC AMPUTATION.

By ROBERT G. Le CONTE, M.D.,

SURGEON TO THE METHODIST HOSPITAL, AND TO THE OUT-PATIENT DEPARTMENTS OF THE PENNSYLVANIA AND THE CHILDREN'S HOSPITALS.

In this note upon the interscapulo-thoracic amputation of the French, I desire to discuss the various procedures that have been resorted to in this amputation, and to give in detail a new method, at the same time limiting my remarks to pathological cases,—*i.e.*, morbid growths. Of traumatic cases requiring this operation I have had no experience.

Berger ("L'Amputation du Membre supérieur," etc., Paris, 1887) has clearly pointed out that the key of the situation is in the control of hæmorrhage; therefore the best method will be one which speedily and clearly exposes the subclavian artery and vein, and at the same time gives a wide field for the necessary ligation. In examining the records of between forty and fifty of the reported cases, I find nine different ways of dealing with the hæmorrhage.

(1) Simple compression of the subclavian vessels. This must always be dangerous and uncertain, as you can never be sure of completely controlling the hæmorrhage; also, there is considerable danger of air being drawn into the vein before that vessel is secured with a ligature. Air has entered the vein on several occasions, although it has not always proved fatal.

(2) Resection of a portion of the clavicle with compression of the vessels. This is also objectionable for the reasons already stated.

(3) Formal ligation of the subclavian artery as the preliminary step of the amputation. This ligation is often difficult and tedious, owing to the smallness and depth of the field in which the vessels are exposed, and there is considerable danger of wounding them before they can be secured.

(4) Formal ligation of the vessels at some time prior to beginning the amputation. This was done once by Wyeth (personal communication) under cocaine, before the ether was administered for the amputation. The same objections will hold here as in number 3, with the added one that, if much time elapses between the ligation and the amputation, gangrene of the arm may follow.

(5) Resection of the middle portion of the clavicle with ligation of the artery, the vein remaining unsecured until just previous to the time of cutting it. This leaves a very vulnerable vessel needlessly exposed.

(6) Ligation of the artery, and proceeding with the amputation, leaving the vein and brachial nerves as the last tissues to be divided. This seems also needlessly dangerous, as the vein could so readily be injured or torn.

(7) Beginning with a T-shaped incision over the scapula and working forward, leaving the great vessels alone until nearly the close of the operation. This must always lead to a maximum of hæmorrhage, as the source of the blood-supply is not dealt with until the end of the operation.

(8) Resection of the middle portion of the clavicle with ligation of both the artery and vein. This is recommended by nearly all authorities, and is at present considered the operation of choice. And yet it is not free from difficulties and dangers. Macnamara (*Lancet,* 1878, Vol. i, p. 669) resected the clavicle, but could not find the artery, owing to the large venous trunks exposed. Nevertheless, the operation was persisted in, the hæmorrhage was enormous, and the patient died the following day. Lund (*British Medical Journal,* 1880, Vol. ii, p. 617), while resecting the clavicle, wounded the subscapular artery, and experienced great difficulty with the hæmorrhage. Von Langenbeck (*Archiv für klinische Chirurgie,* 1862, Vol. iii, p. 340) experienced considerable difficulty in ligating the vessels after resecting the clavicle. Ollier (*Lyon Médical,* February, 1885, Vol. xviii, p. 158) resected the clavicle and had to ligate the vein first, and then experienced considerable trouble in getting the artery. Morisani (*Il Mor-*

gagni, 1885, tome xxvii, p. 505) had great difficulty in finding the vessels after resecting the clavicle. Keen (*American Journal of the Medical Sciences,* June, 1894) also found the ligation of the vessels extremely difficult, and ruptured a large vein under the inner sawn end of the clavicle, which produced a very annoying hæmorrhage. He states that most of the time spent on the operation was consumed in securing the vessels. It is therefore evident that this procedure is not always simple and devoid of risk, owing to the narrowness of the field and the depth at which the vessels are exposed, and it leaves the sawn end of the clavicle as a constant menace to the adjacent veins while the operation is being completed. Again, you are advised to resect the clavicle within the periosteum whenever possible, leaving to the patient the inner third of the bone and two-thirds of the periosteum. Such a procedure, when any portion of the clavicle is involved in a malignant growth, must of necessity defeat all hope of a radical cure, and, to my mind, nothing short of the removal of the whole bone with its periosteum should be attempted.

(9) Disarticulation of the sternal end of the clavicle with compression of the vessels. This has been done by one man only, Mussy (*American Journal of the Medical Sciences,* 1837, Vol. xxi, p. 390), in 1837, and has since been condemned by all authorities who refer to the case. The compression of the vessels was of course faulty, and resulted in air entering the vein prior to its ligation, but after the amputation had been completed. Berger says that (*Ibid.* p. 294) "the disarticulation of the internal end of the clavicle must be formally rejected; it exposes the subclavian vein to being wounded: the single surgeon who has practised it, Mussy, saw air enter the vein in question." Air entered the vein after the amputation proper was completed, and only as a fault of the compression prior to the securing of the vessel. That the disarticulation of the clavicle had anything to do with it I cannot see; nor can I understand why a resection of the clavicle over the site of the vessels is less dangerous than a disarticulation three inches or

more away from them. [This reference was found after my patient had been operated upon.]

(10) Disarticulation of the sternal end of the clavicle, with ligation of the artery and vein. This method was used in the case about to be reported; and I give the full details of the procedure, dividing it, for convenience, into seven steps.

(1) The incision is begun over the sternal end of the clavicle, carried along that bone to about its middle, and then curved downward to the anterior axillary fold. The skin and superficial fascia are dissected up, exposing well the inner two-thirds of the clavicle.

(2) The clavicle is disarticulated by severing its attachments to the sternum and the rhomboid ligament, the clavicular attachment of the sterno-cleido-mastoid muscle is cut close to the bone, and the clavicular portion of the pectoralis major is separated with the finger from the costal portion of the muscle up to the anterior axillary fold.

(3) The clavicle is now pulled upward and outward, and if the subclavius muscle does not readily strip off, its attachment to the first rib is divided. The pectoralis minor will now be well exposed, and it is divided, and the coracoid portion reflected upward with the clavicle. This exposes the axilla fully, and the vessels are seen traversing it from the anterior scalenus muscle down.

(4) The sheath of the vessels is opened and the vein dissected away from the underlying artery. Two ligatures are passed around the artery and tied. The arm is then held up to empty it of blood, while two ligatures are passed around the vein, but these are not tied until the arm is blanched. This renders the use of an Esmarch bandage unnecessary. It must be noted that the cephalic vein has joined the axillary below these ligatures, or else separate ligature of that vessel is required.

(5) The vessels are now severed, together with the brachial plexus of nerves, and the costal portion of the pectoralis major. This completes the division of the anterior attachments of the arm.

(*6*) A posterior incision is now carried from some point on the anterior incision (as near the tumor as it is deemed advisable to go) directly backward and downward to the inferior angle of the scapula, and up again to the posterior axillary fold. The skin and superficial fascia are dissected up for a short distance (half an inch to an inch).

(*7*) The trapezius is now severed and the transversalis colli or posterior scapular artery secured; the omo-hyoid muscle is cut and the suprascapular artery secured, and the muscles attached to the inner border of the scapula are rapidly divided close to the bone; then the serratus magnus and latissimus dorsi are cut, the latter at the posterior axillary fold. The arm is now held to the body by the skin of the axilla alone. If there is sufficient flap to cover the wound, the anterior and posterior incisions are joined through the axilla, but if more skin is needed, a flap may be raised from the under surface of the arm. The wound is then closed with suitable provision for drainage.

The procedure just detailed seems to have the following advantage:

(*a*) It gives the widest and fullest possible exposure of the vessels, and decreases the accidents of ligation to a minimum.

(*b*) The disarticulation of the clavicle is simpler, quicker, and easier than a resection of the bone, and the danger of wounding important vessels is less, because these structures are well protected by the sterno-hyoid and sterno-thyroid muscles.

(*c*) The elevation of the arm, after securing the artery and before the vein is tied, makes a practically bloodless amputation.

(*d*) The suprascapular and posterior scapular arteries (the only other vessels that can bleed) are easily picked up before being cut.

(*e*) In malignant growths, where the outer end of the clavicle is involved, there is less risk of a return if the entire bone with its periosteum is removed.

(*f*) It removes everything in one piece, a more surgical procedure when dealing with malignant growths.

A. E. T., white, aged forty-nine years, born in England.

Family History.—Father living and well, aged seventy-nine; mother healthy and strong; died at seventy-six from influenza. Three brothers and one sister alive and well.

Personal History.—Always strong and healthy. Rheumatism, twelve years ago, in knee. Gonorrhœa five years ago. No history of syphilis. For past thirty years has drunk freely of whiskey. Occupations: Served nine years in the British navy, followed by eight years in the merchant marine; since then he has been almost constantly a driver of wagons and trucks, which frequently necessitated his carrying heavy weights on his shoulder. Three and a half years ago, while placing a heavy box on his left shoulder, he felt a sharp pain as though a nail had pierced the skin. An immediate examination revealed a small bluish lump, the size of a five-cent piece, on the upper edge of the scapula, hard and tender to the touch. Since then he has not carried parcels on that shoulder. In six months the tumor had grown to the size and shape of a hen's egg, and was frequently painful, even when not pressed upon. This pain sent him to the Polyclinic Hospital, where the growth was excised. Almost immediately it returned again, and at the end of a year was the size of an orange, and at intervals painful. He was admitted to the Pennsylvania Hospital in May, 1897, and Dr. Ashhurst excised the growth, including the outer one-fifth of the clavicle and the acromion process of the scapula. Shortly afterwards the growth again returned, with periodical attacks of severe pain. Three months ago the skin ulcerated over a nodule on the anterior portion of the shoulder. This rapidly became fungoid in character, and oozed blood constantly, and occasionally was subject to more pronounced hæmorrhage. Since the ulceration of the skin appeared the patient has had but little pain. He was again admitted to the Pennsylvania Hospital on April 3, 1899, after a severe hæmorrhage from the fungoid mass.

General condition good, but anæmic. Soft, anæmic murmur heard best over pulmonary area; radials slightly sclerosed, left more so than right. Urine, first examination, negative, but a second specimen showed a trace of albumen with a few narrow, pale, hyaline casts. Other organs negative to examination. The tumor

FIG. 1.—Sarcoma of shoulder submitted to interscapulo-thoracic amputation (anterior view).

FIG. 2.—Sarcoma of shoulder (posterior view).

extends from the top of the anterior axillary fold to the outer third of the clavicle, to the middle of the outer margin of the trapezius, to the middle of the scapula, involving parts of the deltoid, trapezius, and supra- and infraspinatus muscles. It is nodular, firm, and intimately connected to bone, and for the most part hard, except in two places, where the skin has ulcerated. One of these ulcers has developed a fungous mass one and a half inches in diameter. The skin over the remainder of the growth is brawny and tense.

The patient was placed on a tonic treatment for a few days, to build him up, and on April 12 he was etherized, and the operation performed as detailed above. At no time was any difficulty encountered. The exposure of the vessels was extensive and free, and their dissection very easy. The cephalic vein was found emptying into the main trunk at the first rib, and in a small exposure of the parts it would have been impossible to ligate the artery until after the veins had been dealt with. Three silk ligatures were required for the vein, one to the subclavian, one to the axillary, and one to the cephalic, and the portions between divided. By ligating the artery and then elevating the limb before the vein was tied, a minimum of blood remained in the arm, and practically none was lost to the patient. The only ligatures required were those on the artery and vein, the suprascapular and transversalis colli being twisted. The time of operation was one hour and six minutes, which includes the dressing and removal of the patient from the room. The operation was slowly and cautiously done, as it was my first effort, and I feel sure that, in a similar case, I could now shorten this time from ten to twelve minutes, bringing it well within an hour. This would be a distinct gain of one hour, as the average time for this operation is in the neighborhood of two hours, and on some occasions it has lasted as long as three and four hours. The patient was out of bed on the ninth day, and his recovery has been uneventful, except that a small portion of the outer posterior flap necrosed (probably from lack of blood-supply, as there was no infection or rise of temperature). This is now healing by granulation. The shape of the remaining scar is almost like three radiating lines drawn 120 degrees apart.

I desire to thank Dr. Charles D. Hart for the careful notes of the case, and Dr. Francis J. Stewart for the excellent photographs here reproduced.

TRANSACTIONS OF THE PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, November 6, 1899.

The President, RICHARD H. HARTE, M.D., in the Chair.

PYLOROPLASTY FOR NON-MALIGNANT STRICTURE.

DR. JOHN B. ROBERTS presented a man, fifty-five years of age, who had suffered with gastric symptoms accompanied by vomiting for fifteen or eighteen years. It was difficult to get from him an explicit history by which the exact date of the beginning of the vomiting could be ascertained. He, however, had been getting worse for the past year. He was greatly emaciated and vomited nearly all food taken. Eructations and intestinal flatulence were more or less constant symptoms when he first came under the reporter's observation in February, 1899. The character of the material vomited was suggestive of dilated stomach. This diagnosis was confirmed by physical examination, which showed the lower border of the stomach to be much lower than normal. The diagnosis reached was that the case was one of gastric dilatation, probably due to a non-malignant contraction of the pyloric orifice. The other organs of the patient seemed to be normal.

On April 4, 1899, a section was made through the abdominal wall, by which the pyloric end of the stomach was brought into view; a longitudinal incision through the anterior wall of the pylorus was then made. No tumor was found, but the muscular tissue surrounding the pylorus seemed to have become to a large extent fibrous. There was no distinct evidence of a cicatrix from previous ulceration, and no irregular puckering of the tissues. The longitudinal incision was sutured, as in the well-known operation of pyloroplasty, at right angles to the line of incision so as to increase the calibre of the orifice. The stomach seemed dilated, but there was no special evidence of it being displaced downwards.

The man promptly recovered from the operation, has gained many pounds in weight, and when seen a few weeks ago said that he could eat anything and digest it without difficulty.

Dr. Roberts added that in 1896 he operated upon a man who was thought to have a slowly growing infiltrating carcinoma of the pylorus. The patient had violent attacks of pain in the gastric region, and was willing to submit to operation because of his suffering. When the abdomen was opened and the stomach explored with the finger, no tumor was found and no contraction of the pyloric orifice. The patient made a prompt recovery from the operative procedure, and subsequently was greatly improved in his symptoms. He later, however, had some return of pain. The further history of the case is unknown. It was probably a case of gastralgia.

These two cases are of interest, as showing the ease and simplicity with which aseptic exploration of the stomach can be done, and emphasize further the fact that obscure cases are with propriety subjected to exploratory incision. The second case shows the difficulty of making the diagnosis even with the advantages now possessed by the profession in investigation of disorders of the stomach.

GASTRO-JEJUNOSTOMY.

Dr. Roberts reported the following case: R. F., a man aged thirty-five years, who had had symptoms of pyloric obstruction for three or four years, was operated upon by him at the Polyclinic Hospital in November, 1895. He made an anastomosis by linear incision and suturing between the stomach and the jejunum. The patient died on the second day after operation after having had a temperature reaching 104°. An examination of the abdomen and seat of operation after death showed, however, no special evidence of septic inflammation.

INTESTINAL ANASTOMOSIS.

Dr. Roberts presented a specimen showing a lateral anastomosis of the colon and sigmoid flexure made with the Murphy button three months previous to death. The patient was operated upon because of a spontaneous fæcal fistule in the left lumbar region resulting from malignant disease of the sigmoid flexure causing stricture. As the connection made by intestinal anastomosis did not divert the entire stream of fæces from the fistula in the loin, he re-opened the abdomen, and three months after the original operation extracted a portion of

sigmoid flexure containing the malignant growth and the fæcal fistula. The intestine above and below the excised portion was then united end-to-end by means of a Murphy button. Death occurred from sepsis the day after the operation. The specimen showed the lateral anastomosis three months old with an opening not much contracted, and at the same time exhibits the second end-to-end anastomosis, which, however, has not had time to become united.

EXTIRPATION OF GASSERIAN GANGLION.

Dr. Joseph M. Spellissy reported two cases of Gasserian ganglion extirpation.

EXCISION OF THE EXTERNAL TWO-THIRDS OF A GASSERIAN GANGLION, BY THE HARTLEY-KRAUSE METHOD, AFTER PRELIMINARY LIGATION OF THE EXTERNAL CAROTID ARTERY.

By JOSEPH M. SPELLISSY, M.D.,

OF PHILADELPHIA.

It is due to the courtesy of Dr. Thomas G. Morton that it has been my privilege to operate on this case and to report it. By several years, it is yet too early to announce it as a cured case of trifacial neuralgia. It is, therefore, only published now to add to the scant existing testimony concerning the utility or fatuity of ligating the external carotid artery as a step preliminary to the Hartley-Krause method of excising the Gasserian ganglion.

Case of H. S., fifty-five years of age, a blacksmith, who was admitted to the Orthopædic Hospital, of Philadelphia, on July 11, 1899.

The family history is negative. The past history: He does not use tobacco, takes alcohol moderately, and denies specific disease. During the past few months he has occasionally taken small amounts of laudanum to relieve the extreme pain of a right trifacial neuralgia. Excepting neuralgia, he has always enjoyed good health.

The present complaint is that of a right-sided facial neuralgia which began nine years ago. It followed sudden chilling immediately after hard work at blacksmithing. The pain at this time resembled toothache, and several teeth on the right, the affected side, were removed, but without relief.

Four years ago, April 22, 1895, the attacks of pain had become so severe, frequent, and of such duration that Dr. T. G. Morton ex-

cised the right infra-orbital nerve. Eight months' relief from pain followed this operation.

February, 1896.—Nine months after the infra-orbital operation the right inferior dental nerve was excised by Dr. T. G. Morton. Eighteen months' relief from pain resulted.

July 11, 1899.—During the past two years the attacks of pain have increased in frequency, severity and duration. The acts of swallowing, of eating, and of washing the face provoke paroxysms of pain which are agonizing. Temporary relief is sometimes obtained by hard pressure against the cheek. He has been unable to work for some months. He suffers most at night, and cannot sleep till morning.

The physical examination found the heart, lungs, urine, muscular power and action and the sense of taste normal.

The nasal passages exhibited structural deformities and evidences of chronic disease, but not of sufficient degree to cause pressure and excite pain. The presence of pharyngitis and thickened vocal cords were also observed. The hearing is impaired.

The examination of the eyes, kindly made by Dr. A. G. Thomson, discovered in the left fundus a patch of choroiditis that suggested a specific history. The eyes were otherwise normal. The first, the infra-orbital, operation was followed by closure of the right lachrymal duct, and constant watering of the right eye.

The reflexes were normal, with the exception of the knee-jerks, which were impaired.

Sensation was hyperæsthetic in four areas of the right face: First, under the right eye; second, at the angle of the mouth; third, in the vicinity of the infra-orbital scar; and fourth, about the external auditory meatus.

The electrical reactions of the muscles of the face and head, for which I am indebted to Dr. Boyer, were of equal character. The weakest current was used to elicit the response, and even it caused much pain.

The patient was informed that the mortality of Gasserian ganglion removed was about 20 per cent., and he was advised not to run the grave risks of operation unless he considered that life, in his present condition, had become intolerable and not too dear to risk for the sake of at least temporary relief. He elected the operation; a date was set for it and the details of procedure considered.

The reports of operators and the memory of a Gasserian ganglion operation that I had witnessed gave me a wholesome respect for

middle meningeal hæmorrhage, and a readiness to try the effect of a preliminary ligation of the external carotid, as successfully practised by Fowler in his second Gasserian ganglion operation, for which he prepared, and was the first one to prepare, by an external carotid ligation. In his third operation he did his second preliminary ligation of the external carotid,—but this time, on raising the dura from the base of the skull he was so embarrassed by hæmorrhage that he had to pack with gauze and attempt the completion of the operation later, when he was again met by hæmorrhage, which prevented removal of the ganglion. The vessels from which the hæmorrhage came were not named.

The favorable results of L. McL. Tiffany, of Baltimore, obtained by excising the trunks of the second and third branches of the fifth nerve, and of the external two-thirds of the ganglion, that is,—the part of it that is in continuity with the trunks of the second and third branches,—led me to prefer this conservative procedure. It, from reported results, seemed to be sufficiently radical while being free from a history of subsequent loss of the eye on the affected side, such as has followed complete ganglion removal, with the division of the first or ophthalmic branch of the nerve in patients of Rose, Krause, Keen and also of Tiffany.

The day before the operation the carotid ligation and ganglion excision were rehearsed, respectively, on both sides of the head and neck of a cadaver. This proved a most valuable preparation and brought home the necessity, in cutting the bone flaps, to carry the bone cutting fully down to the level of the upper border of the zygoma, to insure a flap that hinges on a level with the floor of the skull. Failure to secure this much embarrasses the operation. The difficulty experienced and the care required for the separation of the dura from the floor of the skull, and from the ganglion itself, was a very necessary training.

July 19, 1899.—The operation was performed with the invaluable assistance of Dr. T. S. K. Morton. The external carotid was ligated near the angle of the jaw and above the hypoglossal nerve.[1] The aim was to tie above the facial and occipital arteries.

A Hartley-Krause flap was cut, chiselled and turned down on a level with the floor of the skull, and though the middle meningeal artery tunneled the bone of the flap and was cut transversely, there was no hæmorrhage. The dura was separated from the base of the

[1] Subsequent reference to dissections leaves me without doubt that I did tie above the arteries.

skull and then slightly slit, as recommended by Tiffany, to get rid of the cerebro-spinal fluid. An excellent view of the field of operation was thus obtained; there being no need of artificial light.

The second branch of the nerve, at the foramen rotundum, was secured by a ligature passed beneath it by a small aneurism needle. The third branch was seized at the foramen ovale by forceps. The two trunks were severed by a cutting hook and the distal ends tucked into the foramina. With the ligature and the forceps as a hold the external two-thirds of the ganglion was now dissected, cut, torn, and curetted away. It was most adherent and was removed in fragments too small to promise results from microscopic study.

A little venous oozing drained continually into the field of operation, which was, as it were, the bottom of a well, but kept in easy view by sponging, and there was at no time a flow of blood that could be called active hæmorrhage.

A gauze drain was left at the base of the brain and brought out at the posterior angle of the wound. The pericranium was sutured independently from the scalp so as to prevent depression of the bone flaps. Where the path of the bone cutting has been broad, depression of the bone flap may be prevented by inserting in each of its angles and in its summit a sterilized peg, to be received in a slot in the skull border opposite.

The eye was closed with adhesive plaster. The double operation occupied nearly two hours. The anæsthetic was ether.

The night of the day of operation the patient suffered from violent ether delirium. He was perfectly rational on the following morning, when the hyperæsthetic areas were found to have become anæsthetic. On account of the flow of cerebro-spinal fluid the dressings were twice reinforced in the first twenty-four hours, at the end of which some of the gauze packing was removed, and it was all out on the second day. The bowels were opened on the second day. On the third day a stitch that had slipped was re-introduced, after slight curetting of the neighboring edges of the wound. The temperature on this day reached its highest point, which was 100°. The convalescence was uneventful. The extremes of pulse rate were 110 and and 65, and of respiration, 24 and 17. The stitches were out on the seventh and the patient in his chair on the eleventh day. He went to a shop to be fitted for goggles on the tenth, and was discharged on the thirty-first day.

For the care of the eye I am much indebted to the kind suggestion of Dr. William J. Taylor. It was washed several times a day

with boric acid solution and kept closed till fitted with goggles, which were worn as a protection for several weeks and gradually abandoned. Examination of the eye by Dr. Thomson at the time of the patient's discharge discovered no change resulting from the operation.

On examining the electrical reactions Dr. Boyer reported no change resulting from the operation, except that whereas before the muscles had responded to three and one-half milliampères, which had caused pain, it took eight and one-half milliampères after the operation to elicit muscular contraction, and it was unattended by pain.

Exhibition of Patient.—It is now two and a half months since the operation, and, excepting one momentary twinge, there has been no return of pain, but there is unequal action of the lower jaw and a dribbling of saliva, which in this instance are the price paid for release from neuralgic pain and for section of the motor fibres of the third branch of the fifth nerve. It was intended, as advised by Tiffany, to attempt the isolation and conservation of these fibres and so avoid this loss of jaw and cheek control, but the time occupied by the essential steps in this operation did not permit it. If the circumstances are favorable I think the effort should be made to save these fibres, and if I were again operating for Gasserian ganglion removal, my present experience would lead me to again, as a preliminary step, tie the external carotid.

DISCUSSION.

Dr. Gwilym G. Davis remarked as to the nutrition of the flap, that he had heard of a case sometime ago in which following the ligation of the external carotid artery the flap sloughed. The flap is cut with its base downwards; therefore, that cuts the vessels coming from above, and, ligating the external carotid, deprives it of blood from below. It is evident that in this case the nutrition of the flap was preserved, but it seems that it is not always so. A method of avoiding the possible occurrence of this disturbance of circulation would be by cutting the flap with its base upwards, instead of its base downwards. Then the circulation of the flap would continue through the blood-vessels, across the scalp, for the circulation in the scalp is very free and extensive.

Dr. Addinell Hewson said that the deep temporal artery comes from the internal maxillary and not from the temporal,—the terminal of the external carotid. The flap can be nourished from the branches of the internal maxillary artery. There are several temporal branches

from that, and it does not require the temporal branches of the external carotid to nourish it, so that in performing the operation, as Dr. Spellissy did, he did the proper thing. He cut into the artery before he got to the portion of the internal maxillary. If he ligated below he would cut off the meningeal branches, of course, but if he ligated above, his object was to preserve the facial, so that he might get anastomosis with the flap through the facial artery and through the occipital. If he ligates below the internal maxillary artery he stops his middle meningeal, but if he ligates in the position he did, he allows the anastomosis to take place between the occipital and the superficial branches of the facial with anastomosis of the temporal.

DR. DAVIS rejoined that as he understood it, this ligation occurred below the internal maxillary. The internal maxillary is given off quite high up. The ligation in this case, he believed Dr. Spellissy said, was behind the angle of the jaw, that is, considerably below the internal maxillary. Therefore, no blood could have been supplied from the deep temporal arteries, nor the meningeal, nor the tympanic, small meningeal, or other various muscular branches. It was probably nourished from the facial.

DR. JOSEPH M. SPELLISSY said that the life of the flap was to be credited much to its good care by Dr. T. S. K. Morton. When its circulation was most in danger, when it was turned down during the operation and subjected to pressure, he gave it substantial help by keeping it warm with moist gauze. At the time of the operation, and for several days after, Dr. Spellissy was ignorant of the terminal history of the case to which Dr. Davis alluded. That the artery had been tied as a preliminary step and had been followed by immunity from middle meningeal hæmorrhage was known; but it was not known that the flap in this case had afterwards sloughed. Had Dr. Spellissy been aware of this he might not have dared to tie the external carotid artery, and had he learned it immediately after operating he would then have kept warm, moist dressings on the flap for a couple of days subsequent to the operation. The event, however, shows that such extraordinary precaution was unnecessary in the case reported.

CASES OF ANOMALOUS SPINOUS PROCESS OF THE SEVENTH CERVICAL VERTEBRA ARTICULATING WITH THE SCAPULA.

DR. H. AUGUSTUS WILSON presented two patients and read the histories connected therewith.

TWO CASES OF ANOMALOUS SPINOUS PROCESS OF SEVENTH CERVICAL VERTEBRA ARTICULATING WITH THE SCAPULA.

By H. AUGUSTUS WILSON, M.D.,

CLINICAL PROFESSOR OF ORTHOPÆDIC SURGERY IN THE JEFFERSON MEDICAL COLLEGE; ORTHOPÆDIC SURGEON TO THE PHILADELPHIA HOSPITAL,

AND

J. TORRANCE RUGH, M.D.,

OF PHILADELPHIA,

DEMONSTRATOR OF ORTHOPÆDIC SURGERY IN THE JEFFERSON MEDICAL COLLEGE.

WITHIN a period of two weeks two patients were brought to the Orthopædic Department of the Jefferson Medical College Hospital, with conditions about the same.

The first patient was sent by Dr. W. F. Morrison, of this city, to determine what could be done for her shoulder, which was supposed to have been injured at birth. The child was seven years of age, of very slender build, and enjoyed excellent health. The history of perfectly normal birth was obtained, also that the condition was noticed soon after she was born and was thought to be a pressure paralysis occasioned in some way at the time of delivery.

Her general appearance was that of one affected with torticollis. The head seemed markedly drawn to the left side, and attempted movement to the right showed the cervical muscles on the left side to be much shortened and quite tense. (Fig. 1.) After being stripped, the seeming lateral turning of the head was found to depend upon the elevation of the shoulder (Fig. 2), and this in turn was readily observed to be firmly ankylosed to the spine. The spare condition of the child favored a very satisfactory examination, and permitted the outlining of all the spinous processes excepting that of the first dorsal.

Movement at the scapulo-humeral joint was free and normal in all directions. When, however, both hands were put forward, the left was found about one and one-half inches shorter than the right;

FIG. 1.—Case I.

also there was noted inability to stretch the arm directly upward (Figs. 3 and 4) when these movements were attempted; the scapula was seen to move about a point at its posterior superior angle as a

centre, and could not be raised and lowered, moved forward or backward, or rotated as could the other one. The diagnosis of "anchoring of the scapula to the spine" was then made, and the case held under advisement.

FIG. 2.—Case I.

In two weeks the second case, a patient of Dr. L. E. Taubel, of this city, presented herself and was operated upon, as detailed later, and the uniformly good results obtained indicated a similar procedure

in the younger girl. The X-ray was used prior to operation, but for some undetermined reason a satisfactory negative was not obtained. The operation was performed on July 13, 1899, by Dr. Rugh, assisted by Dr. H. M. Righter and Dr. T. H. McGhee. The incision was

FIG. 3.—Case I.

made directly over the vertebro-scapular articulation, and the interposed bone readily exposed. The scapular end was first separated, the bone seized with strong forceps and cut off about one and one-half inches higher up. The scapula was then found freely movable.

The wound was dried and closed without drainage, and a large wedge-shaped pad, base upwards, placed in the axilla and the arm firmly bandaged to the side. Union by first intention occurred, and free gymnastic exercises were given to increase the mobility of the

FIG. 4.—Case I.

scapula. No pain or other unpleasant symptoms have followed the operation; the two shoulders are now the same length, and there is every reason to believe that when she has attained her growth there will be present no trace of her former condition.

The elder girl, aged sixteen, when seen by Dr. Wilson, who had not seen the first case, complained of limitation of motion of left shoulder, stating that the left shoulder blade was higher than the right, and had always been so.

FIG. 5.—Case II.

The statements were so similar to those made by patients with rotary-lateral curvature, except as to duration, that no further inquiry was made at that time, and inspection was made at once with the

shoulders and trunk bare above the waist. While standing at ease the left shoulder and scapula occupied a conspicuously higher position than normal, as shown in Fig. 5. With the index and next fingers placed upon either side of the spinous processes, the prominent process of the seventh cervical vertebra was taken as a starting-point to observe any deviation of the spinal column. At once there was observed to be some apparent irregularity, for instead of the usual ease of following the spines of the dorsal vertebræ, something seemed to divert the fingers to the left, which at first appeared to be a divergence of the entire spinal column.

This divergence appeared to be slight bending of the cervical and dorsal vertebræ, with the convexity to the left and with a very considerable amount of rotation, throwing the spinous processes in the line of the conspicuous irregularity above referred to. In bending forward to the extreme limit, the spinal column appeared to arch forward normally, and each of the methods usually resorted to for determination of rotary-lateral curvature demonstrated absence of that deformity.

Attention was now directed to the movements of the shoulders, and the patient was directed to raise both arms from the sides to above the head. In attempting this movement, as the arms reached a point of extension at the sides on a level with the shoulders, it was found that the left shoulder was markedly elevated and occupied a position nearer to the spinal column than the right. (Fig. 6.) The left arm could be raised high above the shoulders when the head was thrown to the right side, for which there was then no apparent explanation, but which, in the light of subsequent events, was clearly due to the ossific connection between the scapula and cervical vertebra.

The left shoulder was not only higher than the right, but was also nearer to the spinal column by one-half inch, which condition was associated with a marked increase in the curves of the left scapula.

Recourse was now had to the X-ray for information as to the condition of the bones, which could not be definitely ascertained by manual manipulative methods. The patient was placed upon her back upon a board table, and the Crooks tube placed directly over the median line of the neck at a height of twelve inches, and Mr. L. H. Prince obtained the photograph (Fig. 7). This showed the presence of an unnatural substance, having about the same density as the ribs in the same subject, and occupying an oblique position, which in

the photograph appeared to start from the cervical vertebræ somewhere below the skull and to extend to the left scapula. The spinal column was shown to be curved with concavity to the left, which is

FIG. 6.—Case II.

not in accord with cases of rotary-lateral curvature where the left scapula is higher. This observation entirely disproved the impressions gained by the previous manual examination. A second X-ray was taken with the patient in the same position as in the first, the Crooks

FIG. 7.—Skiagraph showing patient in the directly antero-posterior position.

FIG. 8.—Skiagraph obliquely from left front, patient on back.

tube, however, being placed about eight inches to the left of the median line of the neck, and the resulting photograph (Fig. 8) is shown, confirming in every respect the conditions found in the first one.

It was now apparent that further and definite information could only be obtained by an exploratory incision, at which time this apparently supernumerary bone could be excised, if practicable. The conditions being explained to the patient and her family, and their full consent being obtained, the patient, on June 15, 1899, was etherized by Dr. H. M. Righter and operated upon by Dr. Wilson, assisted by Dr. Rugh. An incision was made in a line with the supernumerary bone, which was found to be placed superficially, having only a few muscular fibres between it and the skin. As soon as the bone was isolated throughout its length, its fibrous connection with the scapula was severed, and it was found that its upper end was firmly attached to the spinal column, for any motion in manipulation caused a corresponding motion of the head. The upper end was found to have an osseous union with the seventh cervical vertebra, and it was cut by bone forceps quite close thereto. There was no other spinous process for the seventh cervical vertebra. The wound was closed and the patient made an uninterrupted recovery.

The patient was drilled in a few gymnastic movements, which resulted in increased freedom of motion, and very little evidence of the former disability now remains. This patient was at various times taken to several hospitals in this city, but apparently without a correct diagnosis having been made, which is easily accounted for, inasmuch as she was subjected to the X-rays for the first time after she came to the Jefferson Hospital.

Prior to the time of the operation upon the elder girl, and with the X-ray pictures in hand, she was seen at our request by Dr. Harry M. Sherman, of San Francisco, Dr. J. Chalmers Da Costa, Dr. W. J. Hearn and many others, but no positive explanation of this growth was obtained, other than that it was a congenital anomaly of unique form. Dr. Sherman thought it might be an ossified rhomboid muscle; Drs. Da Costa, Hearn, and Wilson were non-committal; while Dr. Rugh, who alone had the advantage of carefully studying the case of the younger girl, believed that an elongated spinous process caused the condition present in both cases.

The bone removed from the elder girl (Fig. 9) was two inches long and one and three-quarters inches in circumference, being firmly attached at its spinal end by bony union, yet showing signs of having

had other form of attachment in early life. At the scapular end there was a well-rounded articulating surface where it was in contact with the edge of the scapula. The bone is in shape, size, and general appearance an enlarged spinous process, having a very dense outer layer and reticulated inner part, and tapering from the base to the apex. It is not so flat as a rib, and shows no evidence of a groove on its under surface.

FIG. 9.

The bone removed from the younger girl (Fig. 10) was one and a quarter inches long and one and an eighth inches in circumference. At the spinal end there appears two small tuberosities, which, together with the space between them, were covered with articular cartilage, as was also the scapular end. These tuberosities gave the specimen the

FIG. 10.

appearance of a spinous process, they being the parts which have attachment with the laminæ of the arch.

Francis L. Parker, in "Observations on Some Osteological Anomalies of the Vertebral Column" (*American Journal of the Medical Sciences*, 1869, n. s., lviii, p. 93), says that "unless associ-

ated with some variety of cranial deficiency, the cervical region is less involved than any of the others."

In searching for an explanation of these unique cases, no similar cases could be found in English, French, or German literature, the nearest approach thereto being found in what is termed cervical ribs.

John Struthers, in his paper "On Variations of the Vertebræ and Ribs in Man" (*Journal of Anatomy and Physiology*, London, 1874, ix, p. 17), says: "It is, however, common among quadrupeds to have the first rib articulating with the seventh cervical vertebra as well as with the first dorsal." He describes eleven specimens of cervical ribs attached to cervical vertebræ found in his dissecting-room in the University of Aberdeen. Nothing to correspond with these two cases now reported were referred to, and we believe them to be unique.

The characteristics of both specimens render justifiable the theory that there has been an extra centre of ossification for a spinous process, and this has been pushed or placed beyond the normal centre for the process of the seventh cervical vertebra, though this does not account for the fact that in both cases there was firm articulation with the scapula.

DISCUSSION.

Dr. De Forest Willard said, that from personal experience he should say that these cases were absolutely unique. If he had ever seen such a condition, he had never recognized it. He could realize that such a condition might exist and on casual examination be taken for a lateral curvature or torticollis. He could not understand how a false rib could arise from the spinous process,—it would more probably spring from the lateral process—neither could he understand how the spinous process could become attached to the internal upper angle of the scapula, for in embryonic life the scapula in its natural condition is a considerable distance from the spinous process. There must have been some developmental fault with abnormal bone growth to have produced this condition which has been heretofore unrecognized.

So far as he could understand from the history, this was not an outgrowth or a prolongation from the spinous process, but was a bone

articulated to it, and also to the scapula, extending directly across and adjoining the two. It would seem to be one of those congenital conditions of development that sometimes occur, but which are exceedingly rare. If this is an exostosis it is certainly in a very peculiar position. He saw a girl last week who had from fifteen to twenty of these exostoses, the tendency to proliferation being very marked in her case, but none of the growths resembling either of these specimens.

Dr. Addinell Hewson remarked that there might possibly be some explanation, judging from the formation of the supernumerary ribs as given in some of the works on anatomy on the subject. In the supernumerary rib we are told that the formation of that rib grows from the lower portion of that rib above and from the interarticular cartilage, and it seemed to him that there might have been a prolongation of this outwards along the body of the vertebra, and thence out along the canal to the spinous process. It is merely a surmise.

Then another point of explanation might come into this, in that the projection of the spinous process, as was hinted at by Dr. Willard, the spinous process might have been greatly enlarged and abnormally developed.

His idea was, on first seeing the case, instead of the spinous process being a simple knob, as it should be in the upper thoracic region, it has obtained more of the view of the spinous process in the cervical region which, above the seventh, ought to be bifid. It seemed to him, from the nature of the spinous process in the negro, that such a condition as this would be absolutely impossible, because the works speak of the deformity, knob-like and not bifid condition, of the lower part of the cervical region and the upper part of the thoracic region, although the knob of the spinous process in the thoracic region has been or is being seen not bifid. In these cases they might have been in a bifid condition. Dr. Wilson did not mention clearly in his paper that he saw any bifid condition of the spinous process.

The other point mentioned by Dr. Wilson is that it might have been a rhomboid muscle. This bone may be an hypertrophy of the lateral bony projections on the seventh cervical vertebra.

Dr. Wilson said that the removed bone in each case appeared to be attached to the vertebral column as a spinous process is normally attached and then deflected to the left, and articulating with the scapula. It resembled a large spinous process and seemed to take the place of the seventh cervical vertebra.

Dr. De Forest Willard said that on examination of the bones

removed the one from the smaller child has apparently not been cut away from the spinous process of the vertebra, but there is a true articulation. If this was an elongated spinous process there would be no such articulation. Dr. Wilson says there was not an articulation or joint at the scapular extremity. In the second case there also seems to be no articulation with the spinous process of the vertebra, and it bears evidence of having been cut away from the spinous process. Certainly the theory of a supernumerary rib would not be carried out.

Dr. H. Augustus Wilson said that with reference to Dr. Hewson's remarks about a bifid specimen, in describing the smaller specimen, attention was called to its having two distinct tuberosities at the vertebra, and in the smaller specimen Dr. Rugh found distinctly a separate articulation, not alone with the scapula, but as well with the vertebra. In the larger specimen Dr. Wilson found a distinct articulation with the scapula, and evidence of there having been previously a fibrous or distinct articulation with the spinal column.

With reference to Dr. Hewson's question as to muscles, it was difficult to definitely determine the exact anatomical positions and relations of muscles, as it was recognized that the presence of this supernumerary bone must alter any such relations.

THE USE OF FIXATION PLATES IN THE TREATMENT OF FRACTURES OF THE LEG.

Dr. Lewis W. Steinbach read a paper with the above title.

ON THE USE OF FIXATION PLATES IN THE TREATMENT OF FRACTURES OF THE LEG.

By LEWIS W. STEINBACH, M.D.,

OF PHILADELPHIA,

PROFESSOR OF OPERATIVE AND CLINICAL SURGERY IN THE PHILADELPHIA POLYCLINIC; SURGEON TO THE PHILADELPHIA AND JEWISH HOSPITALS.

THE universal recognition of the principle of antisepsis has brought about so great a change in the treatment of fractures of the leg, that, excepting for injuries of the severest type, primary amputation is no longer resorted to, and is rarely practised even in hospitals with a large accident service.

This spirit of conservatism has brought into general practice methods formerly employed by the boldest only, and in our day every effort is made to save a leg, no matter how severely it may be crushed, as long as the important blood-vessels and nerves remain intact to nourish the injured limb.

We are prepared to enlarge existing wounds or to make free incisions in order to gain access to the broken ends of the bones, remove fragments, blood clots, bundles of soft tissues which by their interposition prevent coaptation. Sutures, pegs, screws and staples are employed to retain the fragments in apposition to secure union of bone and usefulness of the injured leg.

The application of the Röntgen discovery to the uses of surgery has further expanded the field of conservatism in supplementing the known diagnostic signs by furnishing the means for direct inspection of the broken bones; it enables us to obtain far more reliable information about the direction and the character of the fracture, as well as the position of the fragments than is possible by surface inspection and palpation alone. We can turn the information thus obtained to the purpose of securing greater perfection in the result of the treatment.

It seems that this marvellous discovery has not been accorded its full merit, and it is yet contended that it usually affords

FIG. 1.—Showing broken tibia and fibula at different levels.

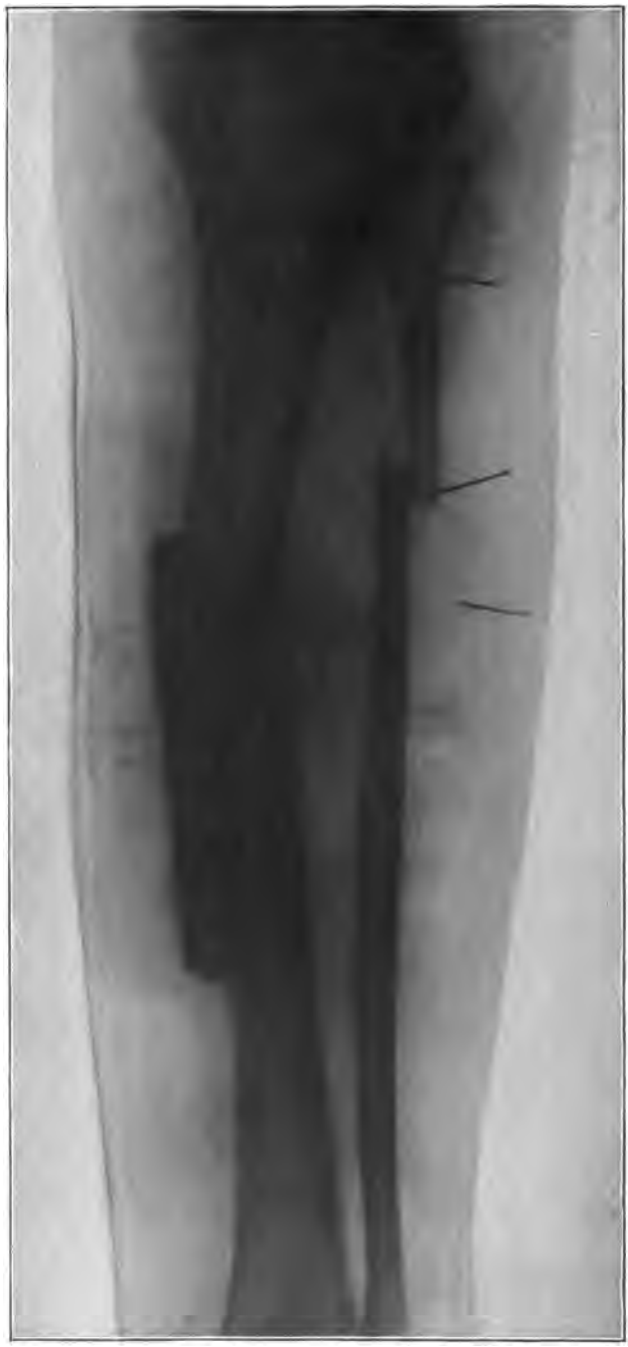


FIG. 2.—Showing good approximation and absence of firm callus.

no better information than can be obtained by inspection and touch. Our own experience, limited though it be, bids us to place the highest estimate upon the value of the skiagram. Even if owing to the direction from which the shadow is cast upon the plate, it at times fails to indicate the line of simple fracture without displacement, on the other hand it does not picture to us fractures, fragments and displacements unless these exist; and instances are not rare where the Röntgen rays have revealed conditions that were not previously recognized.

The danger of the mere possibility of failing to recognize improper apposition of the ends of a broken bone, ought itself make the employment of the Röntgen rays imperative. Viewed from this stand-point, the Röntgen rays become a vital factor in preventing deformity and in securing undiminished usefulness in cases of even severe and complicated fractures of one or both bones of the leg. The result of the treatment, based upon the well-known symptoms alone, and consisting of reduction, application of splints, pads, casts and the like, is generally satisfactory; exceptionally, however, deformity of various degrees with attendant impairment of usefulness of the limb ensues, and the sensation experienced by the surgeon when he views the skiagraphic picture of the malunited tibia, and the consciousness that the deformity might have been prevented if the exact condition had been recognized at the proper time, convert him to the belief held by those who appreciate that the Röntgen discovery has extended the field wherein active surgical interference in cases of fractures of the leg is indicated.

Whenever it is decided to cut down upon a broken tibia for the purpose of securing apposition of the fragments, various methods are available. Among these are,—wire sutures, ivory pegs, steel screws and staples. Our own experience has formerly been limited to the employment of silver wire, variously applied, and whilst it requires considerable disturbance of the soft tissues in drilling through both surfaces of the bone for introduction of the suture, the wire often becomes loose and fails to maintain the fragments in apposition.

Better success has been obtained by the application of a silver plate in the form of a cleat to the flat subcutaneous surface of the tibia secured by small galvanized steel screws. The method is simple in its execution, does not complicate the treatment, is capable of maintaining the fragments in unyielding apposition, and thereby shortens the time required for bony union. Its employment has served to restore broken legs to unimpaired function without shortening. The plate which is designed to meet the indications of any fracture of the diaphysis of the tibia, transverse or oblique, single or multiple, is made of silver one-sixteenth of an inch in thickness, three and one-half inches in length, and three-fourths of an inch wide with perforations for the screws one-half inch apart. The patient being anæsthetized, an incision slightly exceeding the length of the plate is made through the integument along the median line of the inner surface of the tibia, its centre corresponding to the line of fracture when the bone is broken in one place only, or corresponding to the centre of an additional fragment. The integument is loosened laterally, the periosteum not being disturbed. After removal of serrations, spicules of bone, blood clots, soft tissue and other interposed or extraneous substances, the fragments are moulded into position, the plate adjusted, and the drill applied through such of the perforations as are selected for the reception of screws. The drill, slightly smaller than the diameter of the screws to be employed, is carried through the compact structure of the bone till cessation of resistance indicates that the medullary cavity has been reached.

Two screws are usually employed at each end and are secured by means of an ordinary screw-driver. Considerable force is occasionally required to overcome the tendency to displacement of one of the fragments, and has to be applied by the hands of an assistant.

In cases where infection exists or may be expected to supervene, a counter-opening on the posterior surface of the leg must be made and a drainage-tube inserted. Coexisting fracture of the fibula may exceptionally require attention; ordinarily it adjusts itself fairly well when the tibia is properly set. The integument is united over the plate by means of three or

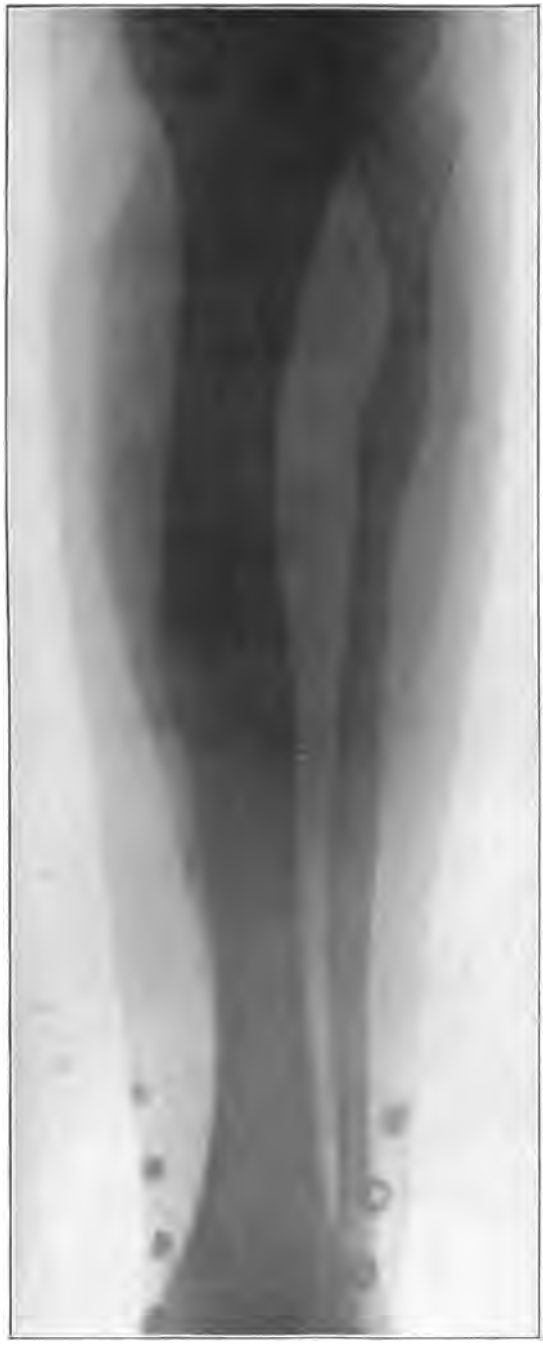


FIG. 3.—Perfect union, lines of tibial fracture obliterated.

FIG. 4.—Showing lateral displacement and loose fragments.

FIG. 5.—Fragment replaced and silver plate secured with two screws in the upper and two into the lower fragment.

four interrupted silkworm-gut sutures. The leg is now placed in a fracture-box or a posterior splint of metal or felt.

After the expiration of about one week the limb may be placed in a silicate of soda case, fenestrated over the position of the plate and over the drainage-tube if one has been inserted, and it may be safe to permit the patient to sit up in a rolling-chair or to be about on crutches. In the simpler cases the wound is apt to unite by first intention, although there is secretion of sanguinolent pus between the plate and integument that may require an opening in the line of the incision for its escape, and can be maintained patulous by a small gauze or rubber drain. The cases of comminuted fracture and cases with infection may demand irrigation which cannot be readily employed when the limb is incased in a silicate case, and it may be preferable to employ a fracture box.

We have found it convenient to practice massage of the affected limb in the third week after the receipt of the injury to prevent the swelling so liable to ensue in these cases. The plate seems to be a harmless tenant in the leg, and is permitted to remain in position until bony union has taken place. Its removal is accomplished with the aid of local anæsthesia alone. The screws are found to sit firmly in the osseous tissue. The following four illustrative cases represent as many varieties of injury to the shaft of the tibia and fibula or tibia alone.

Case I.—Miss M. L. K., aged thirty-two years, on May 27th, 1897, while riding a bicycle came in collision with a moving electrical street car and was dragged along for some distance. Admitted to the Polyclinic Hospital on the same day. On examination a fracture of the right tibia below its middle with the upper fragment slightly protruding through the skin was recognized. Marked loss of blood. Leg was washed, placed in a fracture box, and an ice cap applied over wet bichloride gauze. June 3, swelling and pain subsided, reduction by extension and counterextension, application of silicate of soda case. June 8, a Röntgen ray photograph was taken through the case and revealed an oblique fracture of the right tibia about its middle with serrations and projecting spicules of bone, the upper fragment projecting forward and inward, overlapping to the extent of three-fourths of an inch. Fibula broken at the junction of upper

and middle third, upper fragment displaced outward, likewise overlapping to the same extent. (Fig. 1.) The case was removed, the patient anæsthetized, and reduction attempted with the aid of the fluoroscope; the fragments could not be brought into accurate apposition.

On the following day the patient was anæsthetized with ether, an incision made over the seat of the fracture along the inner surface of the tibia, the ends of the bone exposed, serrations removed by means of bone forceps, and silver plate three and one-half inches long placed over the periosteum secured in place by two screws at each end, integument united with silkworm-gut sutures. June 25, a small sinus at upper end of the wound leads down to the plate, slight discharge of pus. June 26, silicate of soda case applied. June 28, patient left hospital. July 27, skiagraph taken through case shows good approximation of fragments and absence of firm callus. (Fig. 2.) August 17, plate removed under local ethyl chloride anæsthesia. Towards end of October discarded cane, is in excellent health. Two years later, October 28, 1899, skiagraph shows perfect union, lines of tibial fracture obliterated, that of fibula indicated by an oblique union of fragments. (Fig. 3.)

Case II.—J. F., aged thirty-six years. Laborer in iron foundry. Admitted to the Polyclinic Hospital on June 25, 1898. While an elevator this morning the sustaining rope broke, precipitating the cage in which he was standing to a distance of thirteen feet to the ground. The impact caused a fracture of both bones of the right leg about the junction of the middle with the lower third, a large irregular gaping wound, exposing the comminuted tibial fracture irregularly transverse, in direction with a square separate fragment driven into the soft tissues. The wound was irrigated, covered with wet bichloride gauze, the leg was placed in a fracture box and ice applied. Sedatives administered for relief of intense pain. Temperature on June 28, 99.2° F. June 29, temperature 102.6, morphine necessary. Good approximation impossible on account of comminution of bone, wound remains clean, constant irrigation with 1:4000 bichloride solution. Röntgen ray picture shows lateral displacement and loose fragments. (Fig. 4.) July 2, under ether anæsthesia a longitudinal incision over centre of inner surface of tibia down to the periosteum, the incision crosses the transverse wound of the leg, the broken ends of the tibia exposed. A large fragment replaced and a silver plate secured with two screws into the upper and two into the lower fragment (Fig. 5), suturing the incision and the wound in the integument over the plate

FIG. 6.—Showing fragments unapproximated.

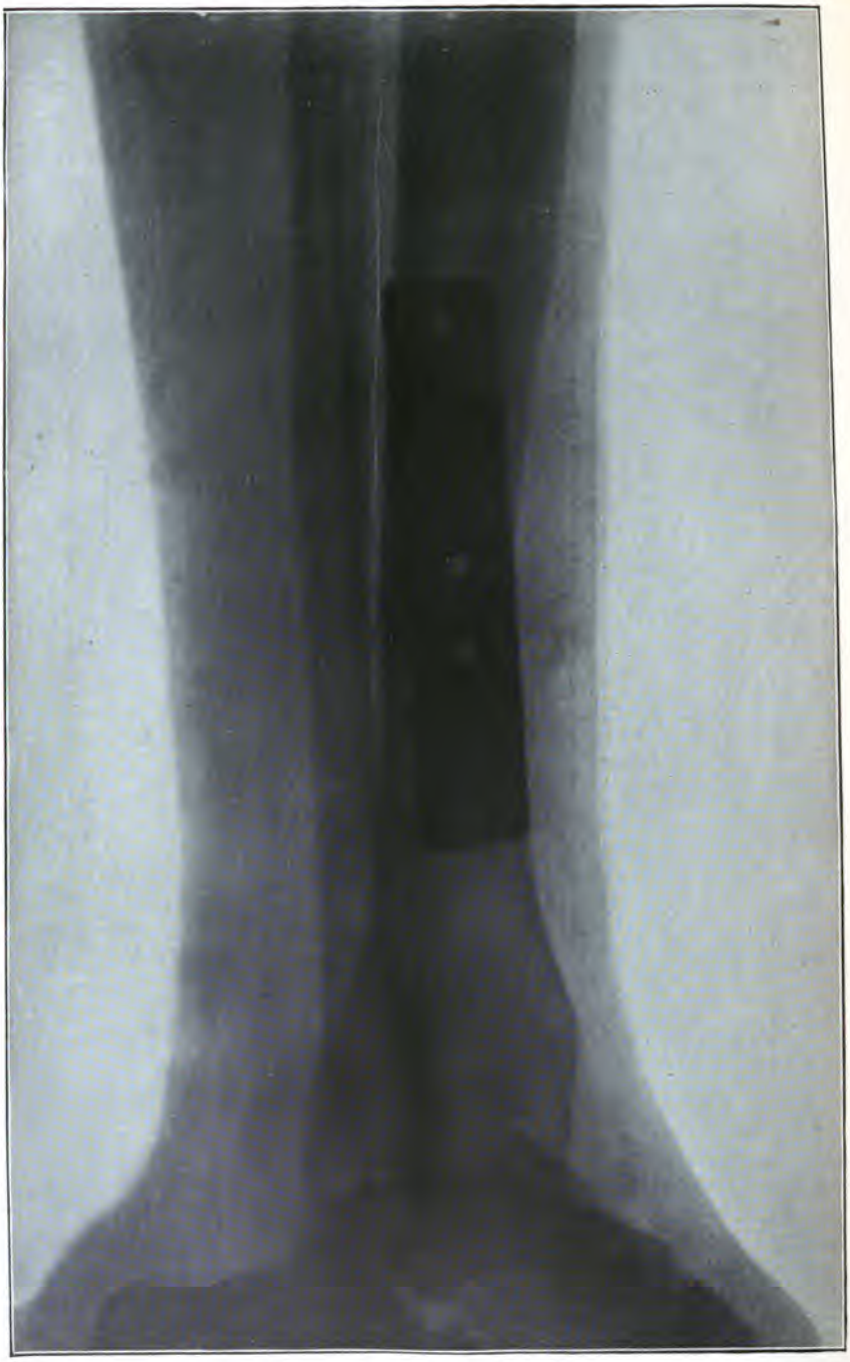


FIG. 7.—Showing fragments approximated and retained by silver plate.

with silkworm-gut. Wet bichloride gauze and a straight splint to inside of leg applied with gauze roller bandage. July 12, a small slough of integument at intersection of incision with wound, partly exposing the plate, offensive odor, slight œdema, appearance healthy, temperature normal. July 16, fenestrated plaster case applied. July 26, wound contracting, no union. Patient has delirium and hallucinations for past ten days, requiring sedatives and tying to bed. August 1, much improved, is about in a wheeling chair in daytime. August 6, rise of temperature, pus behind and below fracture, no delirium. August 22, some dark, foul pus discharging from wound, no union, fragment of necrosed bone removed, temperature of low degree, irregular, at times subnormal; incisions made postero-laterally to drain pus pockets, syringing with hydrogen dioxide and bichloride solution. September 5, no union, marked œdema of the foot, general condition good. September 19, less œdema of the foot. October 18, chill, wound discharges pus, temperature 105° F. October 31, temperature normal, some union, some purulent discharge. November 1, patient passed under the care of Dr. T. S. K. Morton. November 6, case removed, union sufficiently firm to justify it. November 22, the plate is loose from the bone, tenderness about seat of injury, temperature 102° F., several pieces of necrotic bone extracted in ether anæsthesia, removal of silver plate, curettage of exposed part of medullary cavity, an abscess cavity, not in direct communication with the wound, incised from behind, pus evacuated and drainage established. November 29, temperature normal, no pain. December 14, patient left for his home on crutches. Bones firm, no shortening of leg.

Case III.—Mr. J. D. L., aged thirty-five years. May 14, 1899, was thrown from his carriage while driving in the park, sustained fracture of left tibia. Attended by Drs. H. and K. Fracture reduced and plaster case applied immediately. May 15, Röntgen ray photograph shows a spiral fracture of the tibia about the junction of the middle with the lower third. The case was removed, the fracture reduced, a plaster case with steel splints applied, but the fragments were found unapproximated in the skiagram which was taken. (Fig. 6.) May 18, under ether anæsthesia an incision was made over the seat of the fracture, blood clots were removed, the ends offered resistance to reduction, and forcible approximation was necessary. A silver plate was applied and secured in position with four screws. (Fig. 7.) The wound was thoroughly cleansed and closed over the plate. The leg was placed in a fracture box. May 24, the stitches were

removed, temperature was always normal. June 1, slight fluctuation above the plate, puncture and evacuation of a thin sanguinolent pus, a small gauze drainage was inserted. The plate was removed on July 6, and the patient's recovery by this time was complete.

CASE IV.—J. F. D., aged thirty-nine years. Laborer in iron works. Was admitted to the Polyclinic Hospital on July 17, 1899, suffering with a compound comminuted fracture of the tibia and fibula. On July 20, a silver plate was applied by Dr. Stern (Fig. 8), and removed on September 26, 1899. On October 18, 1899, the patient was discharged from the hospital cured.

FIG. 8.—Compound comminuted fracture of tibia and fibula, showing silver plate attached.

DISCUSSION.

DR. DE FOREST WILLARD said that the application of the plate in place of wire certainly stiffens the bone and holds it in better position. It is, however, only in selected cases in which the application of the plate can be intended, in comminution or in cases where there is great displacement. Surgeons are realizing more and more the necessity for fixation of the fragments, rather than trusting them to the uncertainties of the callus, which may or may not be properly encircling the bone in such manner as to secure good union. He had seen in the last three years many cases of non-union and mal-union which illustrated the necessity of absolute fixation. Great security and comfort is obtained by the use of a fixed gypsum dressing that will keep the fragments in thorough position. The old fracture box allows a certain amount of motion and is very likely to be followed by poor results or great overlapping. With the help of the Röntgen rays, for definitely outlining displacement, and when it is impossible to bring the bones into good position, some operative treatment, some form of positive fixation should certainly be tried, and if aseptically performed, suppuration is rarely present and recovery is greatly facilitated. Not only do we gain in time, but we also gain in ultimate strength of bone. A large amount of callus interferes seriously with the circulation of the parts, and we have stiffening from adhesions of the tendons. Nerve-pressure frequently causes suffering and interferes seriously with the use of the member. This question of nerve-pressure and its ultimate results is a consideration which we should always take into consideration in the treatment of fracture.

DR. GWILYM G. DAVIS said that in fractures of the leg, personally he was very loth to undertake operative measures. Take, for instance, in simple fractures, in which there is marked deformity, such as overlapping, as shown in one of the skiagraphs. The fracture almost always runs obliquely from below upwards and backwards, and the upper fragment is pushed forwards. That is almost the constant deformity, and it is increased by the tendo Achillis. Of course, the muscles which bridge the part naturally tend to increase the overlapping, so that whenever there is this troublesome deformity, the first thing to try is to put the leg in the Pott's position, which is bending the leg at right angles to the thigh and laying it on its outer surface, that is, relaxing the tendo Achillis. In some cases the fracture can be gotten into good position by that process. Should that fail, next try extension and counter-extension by means of a long fracture box

going somewhat above the knee. Apply adhesive plaster extension from near the site of the fracture down and from a short distance above the site of the fracture up, fastening the upper adhesive strips to the top of the box. The foot is placed away from the foot-piece and two to six pounds are placed on the lower extension, that will oftentimes bring down another proportion of these cases. Should these two means fail, then resort to the third, which is division of the tendo Achillis. By a combination of these means, he had been able to get the most of his fractures into a satisfactory position. When it comes to compound fractures, even there he would not advocate so radical measures as have been advocated by many surgeons. Almost all of the compound fractures which he had seen had been treated conservatively. There is always a small percentage of operative cases. Anybody who sees any number of these fractures will occasionally come across one in which the wound is so extensive that there is some, but comparatively little, cutting to be done, in order to obtain control of the fragments and institute such treatment as desired; but when we come to fractures with comparatively small openings,—openings from a quarter of an inch to an inch in length,—I think the Treves method of covering the opening with powdered iodoform and placing the limb in a fracture box is such an extremely successful and satisfactory one that he hesitates to resort to operative measures. If, however, operative measures were needed, then he would be inclined to use some method similar to that of Dr. Steinbach.

DR. J. T. RUGH described a case which came under his observation about a year and a half ago. A man had previously had the operation, described by Dr. Steinbach, done for an ununited fracture of the tibia. Suppuration followed and continued profuse until he came to the hospital. Being a laboring man and without means, he had become so discouraged over the loss of his time and means of living that he would consent to nothing but amputation. The surgeon strongly urged an attempt to save the leg, but as the man was determined upon amputation, the leg was amputated. It was his privilege to examine the specimen, and he found the silver plate blackened and lying loose upon the anterior surface of the tibia. The screws were corroded by the action of the pus and secretions of the wound. The ends of the tibia, which had been in apposition at the time of operation, were eroded and softened, so that a space of an inch or more existed between them. There were no spiculæ or sequestra present.

Another case of interest in connection with this subject was one

of non-union of the tibia following an osteotomy of both bones for an acute bow in the leg about five inches above the ankle-joint. The leg was opened in front, a section of bone removed from the fibula, the edges of the tibia freshened, and both bones secured by wire sutures. Suppuration ensued and in three months the wires were removed. The leg has been constantly kept in a plaster-of-Paris dressing and the wound has been dressed every other day. There is now firm union; but one or two small sinuses still persist. The boy is walking on the leg and will have a perfectly useful and straight member in spite of the unfavorable progress.

DR. ADDINELL HEWSON said that no allusion had been made to the adjustable screws of Clayton Parkhill. It seemed to him in cases where there is likely to be suppuration, the screws as advocated by Dr. Parkhill would come in very well, because they allow the proper amount of drainage to take place. He had recently had some experience with these,—not in the line of the cases presented by Dr. Steinbach, but in cases of fracture of the femur. Since then, however, the apparatus has been very much improved, so that now, instead of using that apparatus as it was then presented,—the nickelled steel,—now they give us a nickelled silver. Wessel's silver is the trade name for it. It is entirely a solid metal and non-corrosive. It seemed to him that in some cases which are bound to result in suppuration, the application of the Parkhill screws, where the plate is entirely outside and the screws themselves act as drains for the pus that may be present, would act very well.

DR. JOHN B. ROBERTS called attention to the use of the Röntgen ray for the purpose of diagnosis. While we may gain a great deal by using the Röntgen method, there is a possibility that it may lead some at least, if not all, into mistakes. He saw quite recently a case of ununited fracture of the radius, which was probably indirectly caused by a reliance on the skiagraphic picture. He thoroughly agreed with Dr. Steinbach that a considerable number of fractures should be cut down upon and examined. We make mistakes at times in not exploring fractures. He would be inclined to resort to the plate in ununited fractures to get perfect position and steadiness after resection of the ununited fracture. He would be rather inclined for the ordinary fracture, if it did not keep in good position, to cut the tendo Achillis, as Dr. Davis has suggested, or to apply extension, and to reserve the plate for ununited fractures which need resection. Closed fractures, or those not accompanied by a wound, which do not give good position under ordinary manipulations, he would be inclined to

nail together by some form of nails, box nails or a form of nail devised for that purpose.

DR. HENRY R. WHARTON said that he believed in the primary fixation of the fragments in many compound fractures. He had practised this method in many cases and had had satisfactory results. He had not had very great trouble with the removal of the means of fixation, whether it be heavy silver wire, which is used in certain cases, or whether it be the silver plate fastened by means of screws. In some cases he had had wounds undergo aseptic healing and had had no trouble with the plate afterwards. But in a great many cases the removal of the wire or plate will be indicated in a few months, even if there has been no suppuration immediately after the application. Sometimes it causes irritation and a slight amount of suppuration may develop.

In certain simple fractures exploratory incision and fixation are indicated. Occasionally one comes across a deformity that he has trouble in correcting and it is necessary to resort to operation and some method of primary fixation. In a case under his observation of a simple fracture of the internal malleolus, a fracture of the lower portion of the fibula, the deformity of the fibula was so great and so persistent that he finally had to cut down on the fibula and wire the fragments together. In this case he had perfect healing of the wound; and up to the present time the wire has caused no irritation.

DR. STEINBACH said that he was not inclined to make an operative case of one that could be treated by simpler means; the four cases quoted in his paper were illustrative of those which require a plate or other equally radical measures, and the results obtained not only justify the measure adopted but speak in favor of the plate.

TRANSACTIONS OF THE PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, December 4, 1899.

The President, RICHARD H. HARTE, M.D., in the Chair.

EXTENSION APPARATUS FOR FRACTURED PATELLÆ.

DR. W. BARTON HOPKINS exhibited patients showing results of fracture of the patella treated by a special extension apparatus which consisted of a series of adhesive straps applied to the thigh in an intersecting diagonal form, each strap terminating in a ring at the knee, one-half of the series being attached at the outer side and the other half at the inner side. The ordinary extension cords connect the rings with the pulley-cord over the foot of the bed. It acts like the familiarly known Indian finger puzzle, which, slipping readily on the finger, tightens as traction is made on it and is difficult to pull off. Traction upon the rings exerts two distinct forces upon the thigh, the force of extension downward and the force of constriction. The former draws down the integument of the thigh and, by means of a bridle placed across it, the upper fragment of the patella. The latter, by exerting a continuous unremitting constriction, paralyzes the muscles of the thigh in a remarkable manner, without causing the distal portion of the limb to swell at all from impediment to its circulation. In this respect it acts quite unlike a snug bandage similarly applied. The apparatus does not control the knee-joint, but its disabling effect on the flexors as well as on the extensors of the thigh noticeably prevents any tendency on the part of the patient to flex his leg; the muscular relaxation becomes especially apparent when passive movement of the leg within ten or fifteen degrees is made. Such movement has been made in all these cases almost from the first, and it is readily conducted without at all disturbing the fragments, by simply elevating the knee from the bed. The ultimate

restoration of complete motion at the knee-joint obtained in these cases is largely attributable to this early and continuous passive movement, and partly, too, to the entire freedom from tissue irritation and infiltration following the concentrated pressure of straps, compresses, or other retaining appliances immediately about the joint. The apparatus is usually kept on for seven weeks, and is apt to require one renewal during that time. It is an extremely comfortable one for the patient, which, on account of the long course of treatment required, is a matter of no small importance.

It has been usually applied on the fifth day, after the first inflammatory reaction has begun to subside. Eight pounds' weight is generally sufficient, but there is no disadvantage in adding more, if necessary. It is a matter of common observation that the lower fragment seldom requires any attention; and so it has been found in the cases treated by this apparatus, seldom so much as a steadying strap being used to keep the lower fragment in place.

Dr. Hopkins presented cases in which the injury had occurred from one to five years before, in which the separation of the fragments at the time of the accident varied from three-quarters of an inch to an inch. In all there was very close union of the fragments of the patella, and the restoration to normal function was found to be very perfect. The occupations of the several subjects required severe exertion, including stevedore and athlete. The latter performed some manœuvres requiring great muscular effort and extraordinary activity.

Dr. John H. Brinton presented a man who had received a compound fracture of the patella about twenty-three years ago. He was treated by adhesive strips, extension, and elevation, without any operative procedure; and after twelve weeks the wound and fracture healed with ligamentary union. He was then so unfortunate as to jump from a car and refracture the patella, or rather the fragments separated for an inch or more. He was careful afterwards, and ultimately made a very good recovery.

The separation after healing in this case was nearly a half inch; perhaps it gradually got a little less. There has been some bony union, but as far as the function of the wound is concerned, his motions have not been materially impaired. There is one noticeable occurrence here, and that is, that within the last three

or four years a slight ossific deposit has taken place between the old fragments of bone. The power of the limb has been perfect, and he has been enabled to carry on his usual avocations. In fact, the injury has in no way interfered with his life work.

Dr. Brinton also exhibited two specimens, casts which, he said, presented an almost historic interest. Some twenty years ago, when he was on duty at the Blockley Hospital, he had a patient in the surgical ward, who, before he left, showed him the leg from which these casts were taken, which show, in the extended position, a separation of the fragments of the patella of three and one-half to four inches.

The man recalled to Dr. Brinton's mind where he had seen him in Washington during the days of the Rebellion. He said: "I was a Rebel mail-carrier, and I carried the Southern mail between Point of Rocks and Washington, some twenty-five miles. I travelled sometimes on foot, sometimes mounted, and generally made one trip daily to or fro." He said that such and such a beer saloon was the Southern post-office in the city of Washington, and letters were there received or mailed for delivery. That man at that time was encumbered with this knee, and yet, as he said, he walked twenty-five or thirty miles daily. This bears out the observation of Dr. Hopkins as to the possible usefulness of a broken knee, and in this case the value of the man's limb did not appear to have been much interfered with.

The fracture of this patella had occurred ten or twelve years before the war, in his early life.

Dr. Richard H. Harte said that there are certain classes of cases that every surgeon is called upon to see where a percentage of the cases will do well, and others where an indifferent result will be obtained, no matter what method of treatment is pursued. The character of the fracture and the amount of destruction of the fibrous tissue around the patella influence to a very great extent the amount of deformity. If there is a simple fracture of the patella, without any laceration, to speak of, of the fibrous capsule of the patella, there will be little or no deformity, provided the accessory bands of the quadriceps extensor tendon are left intact. In these cases almost any treatment in which the patient is kept at rest with the leg extended will naturally have a good result. In other cases, where there is a great deal of separation of the fragments, with a corresponding laceration of the quadriceps ex-

tensor tendon, great deformity will result, and difficulty will be experienced in getting a satisfactory approximation of the fragments. Retention of the fragments is often very much complicated by having to deal with a very small portion of bone which has been torn up, especially at the upper attachment of the quadriceps extensor tendon. As to treatment, he had tried almost every known method, including extension, counter-extension, with adhesive plasters, with weights and the Agnew splint. He had used hooks and sutures. In some he had obtained most excellent results, and in some the results had been indifferent. He had used in late years, simply as a matter of convenience, Malgaigne's hooks, which he thought, on the whole, to be one of the most satisfactory means of dealing with these conditions. He had never had any bad results, and he thought the unfavorable accidents which had occurred from the use of the hooks had resulted before the proper introduction of modern surgical asepsis. To illustrate how simply some of these cases can be treated, he detailed the case of a fracture occurring in the person of a bar-tender, who refused to go to bed and remain there, but who, after his physician's visit, got up, and, taking the bung-stave of a barrel, which conformed pretty accurately to the contour of the leg slightly flexed, and, padding the bung-hole carefully, inserted the two fragments of the patella through the hole, and then bandaged it on the anterior portion of the leg. On the return of the physician the next day he was found in this position, attending to his work, and refused to have any further surgical interference. The case ultimately resulted most satisfactorily. Dr. Harte was a firm believer that in all cases of fracture of the patella, after the removal of no matter what dressing that had been used for the retention of the fragments, the leg should be kept in the extended position for many months, allowing no strain upon the new fibrous tissue which is thrown out between the fragments, as in a great percentage of these cases, no matter how satisfactory the result may be, the bond of union may nevertheless be of a fibrous character, and if tension is made upon this new tissue, it is in time bound to stretch, and the deformity will be progressive.

Dr. Gwilym G. Davis said that the two cases here presented are both accompanied by statements of good functional use of the limbs. It depends upon what one considers "good functional results." A child may have a paralyzed leg and may walk far

and get around well, but still one would hardly characterize it as being a *normal leg,* and he thought that these cases resemble those of paralysis. He presumed both of these had practically flail-legs; they would throw the limb out and it would come down with a thump. They may have been able to continue that all day long, but he doubted whether people in the ordinary walks of life would be satisfied with such a result, even though they could manage to get along. He would not call that "good functional results;" it rather goes to show to what extent persons can accommodate themselves to disabilities.

In regard to the cases that Dr. Hopkins had shown, he thought they were among the best illustrations of the conservative studies of the subject that he had had his attention called to. They certainly were a strong argument for conservative treatment. He had operated in these cases many times, and he had never had any trouble, except on one occasion, when, after wiring the patella, a small sinus persisted and necessitated the removal of the wire. This was not accompanied by any disturbance of the joint, and there was never any occasion for alarm. The main object of operating on recent fractures—not compound—is that of saving time to the patient. He had a patient, after he had the patella sewn together, leave the hospital in good condition, and in a comparatively short time rebreak it; and he had come to the conclusion that, as far as his own cases were concerned, he would like them to wear some retaining apparatus for about a year after the reception of the injury, whether their patellas had been wired or whether they had been treated conservatively. In other words, after a patella has healed, it stands in great danger of being refractured; and if it is best to take this precaution for so long after the reception of the injury, one might as well treat it conservatively from the start, rather than subject it to operation.

Dr. De Forest Willard presented a patella removed some eight or ten years after fracture in a woman seventy years old. It has been sawn longitudinally, and on looking at the cancellated structure no evidence of lesion is visible; but upon the posterior and anterior surfaces there is a distinct transverse line marking the seat of fracture. There has been perfect bony union. He attributed the perfect result in this case to the fact that he saw the old lady within five minutes after she fell and she had not attempted to get up. She lay on the floor, had not used her leg,

had not separated the fragments, as there had been no muscular action, and he immediately had her under treatment. The thigh was first placed in a flexed position to relax the quadriceps, and later he applied the Agnew splint, which fixed the fragments and drew them together. There was one-quarter of an inch separation when he first examined her, and the fragments were perfectly movable.

CARCINOMA OF THE RECTUM.

DR. JOHN B. DEAVER presented two patients to show the type of result he had had to follow the modified Kraske operation. The first patient has complete sphincteric action. In the second case the control over the bowel is only partial. In neither of these cases is there much to be seen other than the presence of the scar. In the patient first presented, in addition to the scar, there is still an ulcerated surface at the extreme lower end of the wound, the result of an unhealed fæcal fistula. In the case of this patient he excised three inches of the bowel and made an end-to-end union. Fortunately, the growth was far enough within the verge of the anus to allow the external sphincter muscle to be undisturbed. The fæcal fistula is the result of breaking down of the line of union at the site of the fistula. In his experience, these fistulæ ultimately close. In the case of the present patient, it was necessary to dilate the sphincter muscle some three weeks after the operation to favor the rectum emptying by the natural way.

In the case of the second patient, he was not able to save the external sphincter on account of the low situation of the growth. There is, however, considerable control over the bowel, which he attributed largely to the levator ani muscle. The latter patient is only twenty-five years of age. It is comparatively rare to meet with the disease at this age. The case was believed to be one of simple stricture; digital examination revealed, however, the presence of the induration so typical of these cases. Blood count showed both anæmia and leucocytosis. In this connection he referred to a patient upon whom he operated in the early summer of 1898, doing the same operation as was done in the first patient presented. This man remains perfectly well, with perfect control of bowel. The operation as done by Dr. Deaver consists of removing the lower two or three pieces of sacrum with the coccyx. This is done by separation with the chisel or osteotome and a pair

of scissors grooved on the flat. With the bone removed, efforts are directed to the arrest of the hæmorrhage. The latter, in the speaker's opinion, is one of the most important steps in the operation. The next step in the operation is freeing the bowel. It is important to preserve as much of the levator ani as is consistent with safety, also to divide the bowel at a considerable distance to either side of the growth. Where the section of bowel entails removal of more than two inches, the peritoneal cavity must be opened to allow the sigmoid to be drawn down. So soon as the latter is done to the required distance, the parietal peritoneum at the site of the incision is stitched to the serous covering of the sigmoid and a temporary packing of the gauze placed against the line of suture. This has thus far, in the speaker's experience, served to guard against peritoneal infection.

The remaining step in the operation, the bowel having been removed, consisted in apposition of the two ends with suture. The wound is now carefully and gently packed with gauze and the patient returned to bed. Stitches in the external wound are used simply to close the upper and lower angles of wound; practically all of the wound is left to heal by granulation, being packed tightly with iodoform gauze.

It is not his practice to do preliminary colostomy except in cases where the radical operation is out of consideration.

LONGITUDINAL SECTION OF FEMUR FROM PELVIS FOR ANKYLOSIS FOLLOWING HIP DISEASE.

DR. DE FOREST WILLARD presented a man, twenty-six years of age, who fell, impaling his hip on a fence, at the age of four years. The injury was followed by inflammatory symptoms, then with tubercular infection of hip, and for ten or twelve years abscess followed abscess, until the entire head and neck of the bone had apparently been destroyed. No operative interference, apparently, was instituted, and the upper end of the femur finally became ankylosed to the outer face of the pelvis for several inches, and at a right angle; it was also in the adducted position, the median line of the body falling externally to the outer condyle. To add to his difficulty in locomotion, there had also been a vertebral ostitis, which prevented the spinal column from assuming the usual condition of compensatory lordosis; and, as the spine

was rigid throughout both lumbar and also dorsal regions, he was obliged in walking to throw his trunk to almost the horizontal position at each step. In standing, the heel was eight and one-half inches from the ground; progression was therefore very laborious and painful.

Since a simple osteotomy through the shaft of the femur at

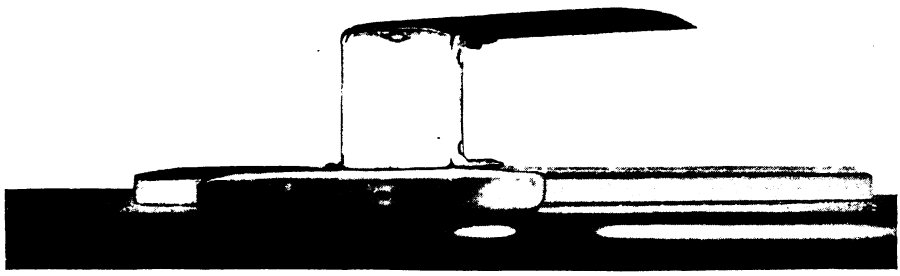
Hip disease. Ankylosis of left hip at right angle. Spine also rigid.

any point would have placed the lower fragment at such an angle with the upper that serviceable union was doubtful, he therefore attempted to cut away the femur longitudinally from its attachment to the pelvis, and bring it into an approximately straight position. A skiagraph assisted in determining the line of section. As the hip was surrounded with cicatricial tissue from multiple abscesses (which had, however, been entirely closed for

nearly five years), a long incision was made through the most healthy tissue, and he was able at last, with the osteotome and chisel, to free the bone; firm, powerful pressure for thirty minutes finally stretched the surrounding fasciæ and tissues until the bone was brought to within fifteen degrees of the straight line, where it was fixed with plaster-of-Paris dressing extending from thorax to toe. With the largely altered tissues and the extent of the section, Dr. Willard expected suppuration, and therefore inserted drainage; but this was very slight, and the wounds were all healed in six weeks; he was walking upon crutches in seven weeks, and now, with only three inches of cork under the foot, is able to walk without a cane, in an erect position, with no adduction, and with a thigh only fifteen degrees out of the straight line.

PELVIC SUPPORT FOR APPLYING GYPSUM DRESSINGS AND SPICA BANDAGES AT HIPS.

DR. DE FOREST WILLARD remarked upon the difficulty presented in applying plaster bandages to trunk and thigh, especially in a fat man or woman, without disturbing motion at the hips during its application and subsequent setting. During the process of setting of a plaster bandage, it is absolutely essential that quiet



Pelvis-supporting stool for applying dressings at the hips.

should be secured, otherwise the long leverage of the leg will certainly impair or break the case at the groin, even if metal strips are used. As a support in such cases, he showed a stool made of two boards fastened in the shape of a cross, one twelve inches, the other eight inches in length. Securely erected upon a post is a thin metal plate six inches long, three inches wide, slightly curved, to add strength and also to adapt itself to the shape of the sacrum; this plate is supported four inches from the

board by a hollow square metal pedestal, so as to give room for the hand and bandage to pass readily between the patient's pelvis and the table. The sacral supporting plate is strongly riveted to this post and projects only in one direction from this post, *i.e.*, upward towards the lumbar region, like an inverted and reversed letter L, " ⅂." When padded with cotton, or gauze, or a towel, the plate is still so thin that it does not interfere with the application of the bandage; and, after the setting of the gypsum, the stool is easily removed by sliding it downward towards the buttocks, since all the bandages have passed above the supporting post. To secure a straight subsequent lying position, a pillow or pad should be placed beneath the shoulders during the dressing, but when ordinary spica bandages or dressings are being applied this is not necessary.

In the application of plaster dressings after the radical operation for hernia, as well as for the ordinary spica in operations about the hips or pelvis, this stool will be found most serviceable, both for children and adults, giving, as it does, a firm and continuous support as long as necessary.

CHOLECYSTOTOMY.

Dr. De Forest Willard presented a woman, fifty-six years of age, who had suffered for eleven months with recurrent attacks of severe pain on the right side of abdomen, attacks being accompanied with rigor, vomiting, and pain throughout the right half of the abdomen, but not radiating towards the right shoulder. These attacks were followed by jaundice, light-colored stools, and tenderness below the costal margin. For several weeks these pains recurred every other day; at times, however, there would be an interval of several weeks; recently, the returns have been more severe; patient had lost flesh rapidly, giving rise to a suspicion of malignant disease.

Patient was admitted to the medical ward of the Presbyterian Hospital, under the care of Dr. Stryker, September 8, 1899. Skin and mucous membranes slightly tinged. Physical examination of chest showed healthy organs. There was tenderness in right abdomen, most marked in the lower segment, and about the umbilicus, rather than over the gall-bladder. Pressure over the appendix quite painful. Attacks of biliary colic continued with increasing severity, commencing in the region of the gall-bladder,

radiating to back, but not to shoulder; the jaundice increasing after each crisis, but yet was very slight; suffering intense. Urine contained trace of bile, and after the attacks showed hyaline casts, occasionally epithelial casts, and at intervals a trace of albumen.

Blood examination showed, September 19, lymphocytes, 22 per cent.; large mononuclear, 4 per cent.; transitional, 17 per cent.; polymorphonuclear, 56 per cent.; eosinophiles, 56 per cent.; no micro- or macrocytosis.

Blood examination, September 21: Lymphocytes, 35 per cent.; large mononuclear, 5 per cent.; transitional, 9 per cent.; polymorphonuclear, 50 per cent.; eosinophiles, 1 per cent.; no macro- or microcytosis.

Transferred to surgical ward (Dr. Willard). Operation, October 2. Ordinary incision. Gall-bladder distended, one-third larger than normal. Large calculus palpable in the neck of the sac, and the dilated commencement of duct. A calculus the size of the last phalanx of one's little finger was removed through small incision at the neck. The duct was examined and no other calculi discovered. The wall of the gall-bladder and the lining membrane both being in good condition, the wound was closed by a row of silk sutures reinforced with a row of Lembert sutures, inverting the wound; the peritoneal abdominal muscles were separately closed by catgut stitches, without drainage; skin closed with silkworm. Patient had no attacks of colic after the operation, and, save for a slight wall abscess from an explainable cause of infection, had no further trouble. At no time was there any discharge of bile from the wound. The stools soon became natural in color and consistency, and the patient improved in health and strength.

Immediate closure of the gall-bladder is only applicable to cases where the walls of the organ are in good condition, and when the contents are not purulent. When indicated, however, this method is of decided advantage in preventing the troublesome and sometimes very tedious biliary fistula that not infrequently (one case in five) follows cholecystotomy with drainage.

Dr. Willard said that he did not intend in reporting the case to have it inferred that the ordinary gall-badder should be sutured, but in certain cases, as in this, where the walls were perfectly healthy, where there was no suppuration whatever, where the

contents of the gall-bladder were simply bile and mucus, it was proper to insert sutures so as to close the bladder absolutely without drainage, and thus gain a good, strong, solid wound; for, in his experience, the biliary fistulæ that remain after an ordinary cholecystotomy are troublesome; some remain for many months, and some for years. He had a patient now with a fistula for two years, constantly discharging bile, and it is of great annoyance to the patient. If there has been suppuration, however, he did not think it wise to trust to such closure.

Dr. Henry R. Wharton said that he thought it to be rather unwise, in the majority of cases, to do the ideal operation as regards the immediate closure of the gall-bladder, since the obstruction in many cases is due to an inflammatory condition of the mucous membrane of the common duct as well as to the presence of a stone in the gall-bladder or duct; and that if closure without drainage, after removing the stone, is resorted to, that obstruction still persists; but in the cases in which drainage is used in the majority of cases the bile escapes from the drainage-tube or the gauze-drain for a time, and as soon as inflammation subsides—as the result of drainage—the re-establishment of flow through the duct occurs. If the surgeon is certain that the ducts are patulous, of course he can consider the immediate closure of the gall-bladder. On general principles, it should not be recommended as a usual operation, but only when one is absolutely certain that the gall-ducts are in good condition to carry off the discharge.

Dr. John B. Deaver said that delay in closure of the fistula does not occur when the gall-bladder is attached to the aponeurosis of the external oblique muscle, leaving the skin and superficial fascia free.

It was his custom to make the incision through the rectus muscle, for one gets better union and a greater safeguard against hernia by so doing. The superficial fascia forms an ideal bed for granulations which close the fistula.

Dr. De Forest Willard said that he did not suture to the skin because, in his opinion, one secures better union by suturing to the deeper tissues, either to the aponeurosis, the peritoneum and transversalis fascia, or the muscles. All that is required is to close off from the peritoneal cavity.

RUPTURE OF THE LIVER.

DR. WILLIAM G. PORTER presented a ruptured liver, saying that the person from whom it was removed was a patient in the Presbyterian Hospital. He was twenty-five years of age, was a railroad brakeman, and was brought into the hospital in a condition of shock, with the history that he had been thrown down and trampled on by quite a large number of men who were endeavoring to escape an approaching collision between two cars. When he was admitted, there was no evidence of any fracture or dislocation. The man was simply profoundly shocked, and had an abrasion over the thorax. He would not locate any trouble at that time. He slowly reacted from the shock, and twenty-four hours afterwards began to vomit. At no time was there any passage of blood, either in the urine or from the bowel or in the vomited matter. In the first place, the abdomen was not distended at all. It was tender, however, on pressure. Vomiting came on about twenty-four hours after his admission. The tenderness increased over his abdomen, and then there was quite considerable tympanitic distention. The temperature then rose, with a very decided difference between the temperature tracings when they were taken under the tongue and when they were taken in the rectum. That difference is almost always uniformly two or three degrees, and sometimes varied as much as four degrees. The vomiting was relieved after about forty-eight hours, when his bowels were emptied by an enema and the internal administration of calomel; but he still lay with this exalted temperature, with pain, with tympanitic distention of his belly, so that all supposed that he had a general peritonitis as the result of the trauma. He gradually declined, and on the sixth or seventh day after the injury he died. At the autopsy, when the abdomen was opened, no evidences whatever of peritoneal inflammation were found, but the whole cavity of his pelvis was filled with blood, and, on looking for its source, it was found in a ruptured liver, which is shown in the specimen.

DR. J. CHALMERS DA COSTA said that some two years ago, in the Philadelphia Hospital, he saw a case of laceration of the liver, resulting from fracture of the ribs. The man had been making an excavation. There had been a fall of earth, and he was brought into the hospital in a condition of shock. The resident physician

examined him and detected two fractured ribs; administered the ordinary restoratives for a condition of shock, and also had straps of adhesive plaster applied to his side for fracture of the ribs. The next afternoon, some twenty-four hours after the accident, it was observed that he began passing into a condition of collapse, with signs of intra-abdominal hæmorrhage, shifting dulness in the flanks, collapse, feeble and rapid pulse, accompanied by abdominal pain. On opening the abdomen, a laceration of the anterior surface of the liver was found, which was bleeding furiously. Stitches were applied, but they would not hold, and the wound was packed with gauze, which controlled the hæmorrhage. The incision was made anteriorly, and, as far as the operator could reach and see, no other laceration was discovered. This hæmorrhage was completely arrested. He lived some forty-eight hours, his symptoms having abated for a time. He, however, became worse with great rapidity, and died forty-eight hours after the operation. The specimens are now in the Philadelphia Hospital.

An examination was made by Dr. Stengel. The bleeding from the anterior wound had not recurred. It was discovered on the posterior surface of the liver that the end of a rib, very near the spine, had inflicted another injury as grave as that inflicted by a rib on the anterior surface. The only way to have found and reached that posterior injury would have been by an extensive rib-resection. The problem is: There has been a severe injury, either a crushing force or an injury that breaks ribs, lacerating the liver on the anterior surface. When an injury is found and the hæmorrhage arrested, should an extensive investigation be made to determine if there is another hepatic injury?

THE RADICAL CURE OF HERNIA.

Dr. Gwilym G. Davis said that in 1895, Dr. George Tully Vaughan, United States Marine Hospital Surgeon, who was then stationed in Philadelphia, brought to his notice his method of operating for the radical cure of hernia. It was published in the *Journal of the American Medical Association* of July 25, 1896. His account is as follows: "Divide the conjoined tendon through its muscular part four or five centimetres above its insertion, including the internal pillar of the ring down to the peritoneum, avoiding the deep epigastric artery. Separate by blunt dissection

the conjoined tendon from the rectus and pyramidalis muscles down to the pubic bone, and place the cord in this position between the conjoined tendon and rectus. The cord still passes through an oblique canal at its anterior portion as the conjoined tendon overlaps the rectus and pyramidalis for 2.5 centimetres or more being inserted in front of these muscles. Unite the divided ends of the conjoined tendon and internal pillar with mattress sutures, and accurately approximate them with continuous and interrupted sutures."

This was the first time Dr. Davis's attention had been directed to transplantation of the cord inward instead of keeping it out in the neighborhood of the internal ring. He insisted on the advantages of having the hernial opening entirely closed from the spine of the pubes out, thus obviating the liability of weakening it by allowing the cord to pass through the line of union. As the recurrences which had come under Dr. Davis's notice had taken place in the line of the wound, he felt that placing the cord at the inner angle was a distinct advantage, and he had practised it with more or less regularity ever since. Being unwilling to cut the muscular portion of the internal oblique and transversalis as Dr. Vaughan had done, he at first divided the conjoined tendon near its insertion into the spine of the pubes, then placed the cord to its inner side and sewed the divided conjoined tendon again down to the pubes. This he felt, however, weakened the abdominal wall at this point, so he soon contented himself with dividing the tissues down to the pubic bone just to the outer side of the conjoined tendon, and allowing the cord to hang over the pubes at this point. Sometimes he would nick the edge of the conjoined tendon to allow a little more room for the cord. The internal oblique and transversalis muscles with the fascia beneath were then sewed to Poupart's ligament, and the external oblique closed with a continuous suture. About this time, Dr. J. Coplin Stinson published his method in the *New York Medical Record* of March, 1896; and recently, in the ANNALS OF SURGERY of October, 1899, he again advocates it. He uses three layers of sutures besides those of the skin. He says, "Commencing at the upper angle, bring the inner and outer borders of the transversalis fascia accurately together with continuous sutures, leaving only sufficient room at the lower angle close to the pubic bone for the cord." He then sewed the internal oblique and transversalis muscles to

Poupart's ligament, and united the cut edges of the external oblique. Dr. Ferguson, *Journal of the American Medical Association*, July, 1899, advocates practically Stinson's method as described above. Believing that the hernia is due to a deficient origin of the transversalis and internal oblique muscles at Poupart's ligament, he says he "entered the sewing (of the internal oblique and transversalis muscles) fully two-thirds down Poupart's ligament, which is the normal origin of this muscle." In the same article he states returns usually occur at the upper and outer portions of the wound. William J. Mayo, writing in the ANNALS OF SURGERY of January, 1899, says he has seen William T. Bull unite the deeper muscles over the cord to Poupart's ligament and then suture the external oblique. William B. Coley, ANNALS OF SURGERY, 1897, p. 280, states that for four years he and Dr. Bull have in some cases placed the cord inward and sutured both the deep and superficial muscles over it. He and Dr. Bull, writing together in the ANNALS OF SURGERY, Vol. xxviii, 1898, p. 599, say that suture of the canal without transplantation of the cord has much to commend it, the remaining steps being the same as for Bassini's operation.

Finally, Dr. Davis was convinced that he had read of others employing the same procedure. These facts, he submitted, were sufficient to show that the supremacy of the operation of Bassini is threatened, and a new school is arising which opposes the laying of the cord either between the superficial and deep muscles, as does Bassini, or over both, as does Halsted, and advises instead the union of both layers over the cord. Comparatively few, however, go to the length of G. R. Fowler, ANNALS OF SURGERY, Vol. xxvi, 1897, p. 603, who advises placing the cord within the peritoneal cavity.

A second point to which attention is called is the treatment of the transversalis fascia. Dr. J. C. Stinson and Ferguson both sew it as a separate layer. He knew of no others who do; Bassini and Halsted do not. Personally, he had sometimes found the transversalis fascia so thick as to enable one to suture it shut separately, but usually he had brought both the deep muscles together with the underlying fascia to Poupart's ligament in a single layer of sutures, and then closing the incision in the external oblique.

In dealing with the sac after ligating it as high up as possible and cutting it away, he had brought the two ends of the chromi-

cized ligature up through the muscles above the internal ring and tied them on the surface of the external oblique. The peritoneum having been somewhat separated, this procedure allows the site of ligation to be drawn up somewhat higher than it otherwise would be, and fixed in place.

In concluding, the following propositions are submitted for discussion:

(1) Is it best to lay the cord close to the outer edge of the conjoined tendon and unite all the structures above the peritoneum over it?

(2) Is it always possible or advisable to unite the cut edges of the transversalis fascia as a separate layer?

(3) Is there any advantage in ligating the ends of the sac ligature on the muscles above the internal ring instead of cutting them short?

Dr. John B. Deaver advocated the Bassini operation, with one modification, the Macewen method of disposing of the sac. Macewen's operation has two very strong points in its favor. One is the non-division of the aponeurosis of the external oblique. That is one of the weakest points of any open operation. The divided aponeurosis of the external oblique cannot be restored as nature made it. Then, the second point is the disposition of the sac. The cases of recurrence he had seen, in the majority of instances, had occurred at the upper point of the wound, at the site of the so-called internal ring,—there not being such a thing anatomically. Now, if that is the case, it would argue in favor of the open operation as far as the restitution of the lower part of the canal is concerned. It is in the majority of cases that the recurrence takes place above, which shows that the integrity of the lower part of the canal is restored by the Bassini operation.

He understood that Dr. Davis passes the ends of the ligature used to tie in the neck of the sac through the overlying abdominal walls, tying them down upon the aponeurosis at the external oblique, and in this wise fixing the neck of the sac well within the internal abdominal ring. This, to his mind, does not, however, dispose of the concavity upon the inner aspect of the abdominal wall which exists in the shape of the external inguinal fossa. That this fossa, coupled with elongation of the mesentery, accounts for the majority of cases of inguinal hernia of the small bowel, must be admitted. Dr. Davis's method, therefore, does

not dispose of this concavity. The nearest approach to it is the Fowler and Halsted method, where the peritoneum is cut off flush with the parietal peritoneum and sutured. It is Dr. Deaver's practice to invaginate the hernial sac after the manner of Macewen, carrying it through the mouth of the hernial sac and anchoring it at this point. He knew that objections had been raised against this method of disposing of the sac, as in Coley's paper referred to by Dr. Davis. Coley takes the ground that nutrition of the sac when disposed of in this manner is in danger, and that sepsis and suppuration are more likely. This may be true, but it had never occurred in the practice of the speaker. He agreed with Dr. Davis that it is relatively better not to cut the internal oblique muscle. This is one of the strongest objections to Halsted's operation.

Dr. Richard H. Harte said that his own method was a modification of Halsted's, and he had no fault to find with that operation. He agreed with Dr. Deaver, and also with Dr. Davis, that when recurrences occur they start in the upper part of the incision, or the so-called internal abdominal ring, which is supported almost entirely by muscular tissue. He thought there was very little difficulty in closing what corresponds to the external ring, but pouting in the upper part of the wound is not at all uncommon in persons especially of relaxed abdominal walls, say a couple of inches from the spine of the pubis. Every surgeon who has attempted to operate the second time on cases of recurrence knows how unfavorable these cases are. The question of dealing with the sac is a most important factor in the success of all hernia operations. The method pursued consists in cutting off or tying the end of the sac, tying a purse-string around it and dropping it back or pouching it after the method of Macewen. The other methods are faulty, as they do not obliterate the hernial pouch in the peritoneum, leaving the conditions favorable for recurrence. The Macewen proposition to make a large plug and leave it there, is undoubtedly good, as it acts as a buffer in cases of attempted recurrence; but it is not always a safe procedure, as he recalled two fatal cases, one which he saw operated on and another in the service of a colleague. The unfavorable results were undoubtedly due to the sloughing of the sac. He had tried faithfully all of the different methods for the radical cure of hernia, and felt convinced that some modification of the Italian

operation is the best; but, nevertheless, the weak point of all operations is the failure to fortify the so-called internal abdominal ring.

Dr. W. Joseph Hearn said that the recurrences that he had seen took place in the upper part of the incision. For that reason he never did a Halsted operation. He did not care to cut these muscles, for more or less atrophy takes place; they are left weak. He very rarely saw a hernia occur close to the pubic bone. He had come to the conclusion that it is better to leave the cord on the pubic bone, where nature intended. He was sure that there are a great many cases of strangulated hernia where the patient's condition did not justify a radical operation for its cure. He had been in the habit of sewing up the ring with silver wire and leaving it there. He had never had infection, and he had had no return of the hernia. He simply made a barrier of silver wire.

Dr. Robert G. Le Conte said that he did not see that a hernia could return in any other position except the upper part of the wound, if that is the place the cord leaves the peritoneal cavity. The internal ring, where the cord leaves the peritoneum, is the point of weakness, and whether one makes this high up in the incision, as in Halsted's operation, or low down, as in Stinson's, it will be the point at which recurrence takes place. As to the radical cure of hernia in the operations spoken of,—Halsted, Bassini, and Stinson,—the principles are different. Dr. Halsted brings the cord directly out of the abdominal cavity, at a right angle to the plane of the abdominal wall, and diminishes its size by the ligation of some of its veins. In this way the intestinal pressure from gravity is removed, but the general intra-abdominal pressure is in no way combated, except by the slight diminution in the size of the cord. Dr. Stinson's operation is the opposite of Halsted's in that the cord is brought out at the lowest portion of the incision and deflected towards the median line. It does not oppose the intra-abdominal pressure or the gravity pressure, except by the angulation of the cord as it goes over the pubic bone. Here recurrence should take place always at the lower portion of the wound. Bassini's principle is to return the inguinal canal to its original condition, and so oppose the recurrence of hernia by nature's method. When a hernia takes place and has persisted for some time, the internal and external rings are approximated. The internal ring descends and approaches the external ring, and in

an old hernia the two rings will practically be together. In the normal abdomen, we have a distance of an inch and a half or two inches separating the position where the cord leaves the peritoneum and where it makes its exit through the abdominal wall. The strength of the inguinal canal in a normal abdomen is due to its oblique passage through the abdominal wall and to the muscular action of the external and internal oblique. These muscles acting, the fasciæ overlying and underlying the cord are drawn tense, and the longer the canal the greater will be the resistance to the passage of bowel. He did not see why a long mesentery or any peculiarity of the fossa should be more than a slight predisposing cause of hernia. He knew of several men who had gone through an active existence, to the age of sixty and sixty-five, who had suddenly developed hernia during a paroxysm of coughing. He did not think this was due to a sudden lengthening of the mesentery or to any changes of the fossæ inside of the abdomen, but rather to a relaxation and loss of tone in the muscular walls of the abdomen from old age. In other words, the length of the mesentery and the fossa had remained in the same condition for many years, but the muscles and fascia of the abdomen had changed from age. He therefore thought that Bassini's operation is the best in theory, and in his practice it had proved most successful in suitable cases. Any modification of it, however, is faulty, as it defeats the principle on which it is founded.

Dr. Gwilym G. Davis said that, as far as the use of the sac as a pad goes, that has been thrashed over pretty thoroughly of recent years, and he thought the verdict of the profession was practically against it in inguinal hernia. In femoral hernia it is still open to discussion. The question that he had hoped to see discussed was that of the transversalis fascia. Is there or is there not a transversalis fascia forming a distinct layer? Dr. Deaver apparently settles the question when he says there is no internal ring, because the internal ring is commonly supposed to go through the transversalis fascia. As far as Dr. Davis's personal experience went, he believed that sometimes there is a fascia that can be sewn together separately, distinct from the muscles above and peritoneum beneath. One will sometimes find just beneath Poupart's ligament another layer of fibres, which he believes is the thickened edge of the transversalis fascia. When he found thickening of this sort, then he united it as a separate layer. But

it is evidently not there always; therefore he hardly saw the justness of Drs. Stinson and Ferguson describing uniting the transversalis fascia as a distinct layer as a routine procedure. As regards the incision of the muscles. One reason why he was induced to transplant the cord internally was that he did not believe in dividing the external oblique muscle to anything like the extent usually done in operating for these herniæ. Hernia recurs towards the outer portion. The only object of making this incision so far out is to gain access to the internal ring, and he thought this could be done without going so far up as many operators do. The only difference between the incision for this operation and that of Bassini is that in this the incision goes a trifle closer to the median line, so as to enable one to expose the spine of the pubes and carry the knife down to the bone. The cord is laid there, and one is enabled to bring the conjoined tendon and its muscles closer down to Poupart's ligament.

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